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TECHNICAL MEMORANDUM NO. 4

CHEMICALS OF CONCERN

**HUMAN HEALTH RISK ASSESSMENT
WALNUT CREEK PRIORITY DRAINAGE
OPERABLE UNIT NO 6**

DRAFT

ROCKY FLATS PLANT

**U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado**

**ENVIRONMENTAL MANAGEMENT DEPARTMENT
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INTRODUCTION

This Chemicals of Concern Technical Memorandum is presented as part of the Baseline Risk Assessment (BRA) for the Walnut Creek Priority Drainage, Operable Unit 6 (OU-6), located at Rocky Flats Plant in Golden, Colorado. The BRA, which consists of the Human Health Risk Assessment (HHRA) and the Environmental Evaluation, will be included in the Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) report for OU-6. The RFI/RI is being conducted pursuant to the U.S. Department of Energy (DOE) Environmental Restoration Program, a Compliance Agreement between DOE, the U.S. Environmental Protection Agency (EPA), and the State of Colorado Department of Health (CDH), and the Federal Facility Agreement and Consent Order (Interagency Agreement), signed in 1991.

This technical memorandum has been developed to select chemicals of concern to be evaluated in the HHRA. The HHRA will evaluate potential human health risks for on-site and off-site receptors under current land use and probable future land use conditions, assuming no remedial action takes place at OU-6. Chemicals of concern are organic chemicals, metals, or radionuclides that exceed background range, that are environmental contaminants, and that could be a significant threat to human health under the exposure conditions evaluated. Chemicals of concern are identified on an OU-wide basis for each medium (e.g., groundwater, soil) through which exposure to contaminants could occur. The identification of chemicals of concern will also help focus the efforts of environmental transport modeling, description of the nature and extent of contamination, and remedy selection.

Chemicals of concern are selected for surface soil, subsurface soil, groundwater, pond surface water, pond sediment, and stream sediment sampled during the Phase I RFI/RI at OU-6. These are the environmental media of concern for direct contact with contaminant source areas in OU-6 and for contaminant transport. Chemicals of concern are identified on an OU-wide basis, pooling sample analytical results from the various sampling locations for each medium. OU-6 consists of 21 Individual Hazardous Substance Sites (IHSSs), whose locations are shown in Figure 1-1. The IHSSs or IHSS groups and the environmental media sampled at each are listed below. IHSS groups contain several individual sites, for example,

IHSS 142 consists of 10 ponds in the Walnut Creek drainage, numbered 142 1 through 142 9 and 142 12

IHSS or IHSS Group	Name	Surface Soil	Subsurf Soil	Ground- water	Surface Water	Pond Sed	Stream Sed
141	Sludge Dispersal	X		X			
142	Ponds			X	X	X	
143	Old Outfall	X	X	X			
156	Soil Dump	X	X	X			
165	Triangle	X	X	X			
166	Trenches A,B,C		X	X			
167	Spray Fields	X	X	X			
216	East Spray Field	X	X	X			
	Streams						X

This technical memorandum is divided into the following sections Section 2 0 describes the general process to select potential chemicals of concern Sections 3 0 through 8 0 present decision criteria specific to each medium and identify the chemicals of concern selected for each medium References are listed in Section 9 0

Appendix A, "Background Comparison for Metals and Radionuclides," summarizes the statistical methodology used to compare OU-6 data to background data and includes tables showing the results of the statistical tests Statistical tests were used to identify metals and radionuclides whose concentrations exceed background levels and which may be environmental contaminants These metals and radionuclides are retained for further evaluation as potential chemicals of concern

Appendix B, "Risk-Based Evaluation of Infrequently Detected Chemicals," presents the screening of infrequently detected compounds (<5 percent detection frequency) to identify those that merit further evaluation on the basis of an extremely high concentration, as special-case chemicals of concern in small areas of localized contamination

Appendix C, "Total Suspended and Dissolved Solids in Groundwater," is included to support the discussion of contaminants of concern in Section 5.0

CHEMICALS OF CONCERN SELECTION PROCESS

2.1 OVERVIEW

The flow chart for selecting chemicals of concern for OU-6 is presented in Figure 2-1, Process for Identifying Chemicals of Concern. The process is intended to identify the chief environmental contaminants in each medium that could have adverse impacts on public health. In this way, the risk assessment is focussed on OU-6 contaminants that are potential significant health hazards. Inorganic compounds whose concentrations are within background range or that are minor constituents (e.g., rarely detected and/or of low toxicity) are excluded from the risk assessment. Organic compounds that would contribute negligibly or not at all to overall risk are identified but are not included in the quantitative risk assessment.

Chemicals of concern were selected on an OU-wide basis for each medium. The individual steps shown in Figure 2-1 are listed below and described in the following sections:

- 2.2 Data Evaluation
- 2.3 Background Comparison for Inorganic Compounds
- 2.4 Essential Nutrient Screen
- 2.5 Frequency of Detection
- 2.6 Concentration/Toxicity Screens
- 2.7 Application of Professional Judgment
- 2.8 Risk-Based Evaluation of Infrequently Detected Compounds
- 2.9 Identification of Chemicals of Concern

2.2 DATA EVALUATION

2.2.1 Media-Specific Data Sets

Analytical data from environmental samples collected during the OU-6 field sampling program and RFP site-wide sampling programs were used to characterize contamination in

OU-6 The samples were collected from August 1992 through May 1993 Table 2-3 lists the analytical parameters collected by IHSS and sample media For water samples, both unfiltered and filtered information are presented Table 2-4 lists the target compounds in each chemical group Samples from the following media were collected and evaluated surficial soil, subsurface soil, groundwater, pond sediment, pond surface water, stream sediment and dry sediment

Surficial Soil

Surficial soil samples were collected using the RFP soil method The analytical parameters varied from one IHSS to the next as described below Samples were collected from the third quarter of 1992 through the first quarter of 1993

IHSS 141 (Sludge Dispersal Area) - Forty surficial soil samples were collected Samples were analyzed for pesticide/PCBs, metals, nitrate and radionuclides

IHSS 156 2 (Soil Dump Area) - Twenty-two surficial soil samples were collected Samples were analyzed for metals, TOC and radionuclides

IHSS 165 (Triangle Area) - Fifteen surficial soil samples were collected Samples were analyzed for metals, TOC and radionuclides

IHSSs 167 1 and 167 3 (North and South Area Spray Fields) - Thirty-two surficial soil samples were collected to a depth of five centimeters Twenty-four surficial soil samples were collected in IHSS 167 1 Eight surficial soil samples were collected in IHSS 167 3 Samples were analyzed for metals, TOC and radionuclides

IHSS 216 1 (East Spray Field) - Six surficial soil samples were collected to a depth of five centimeters Samples were analyzed for metals, TOC and radionuclides

Subsurface Soils

Subsurface soils were collected from the fourth quarter of 1992 through the first quarter of 1993. Subsurface soil analytical parameters and depth intervals varied from one IHSS to the next as described below.

IHSS 156.2 (Soil Dump Area) - Twenty-two soil borings were drilled three feet into the undisturbed soil beneath the fill. Samples were taken continuously in these soil borings and composited for each 6-foot interval in the fill material. An additional composite sample was collected from the three feet interval below the fill. Samples were analyzed for VOCs, metals and radionuclides.

IHSS 165 (Triangle Area) - Nine soil borings were drilled three feet into weathered bedrock. Two monitoring wells, 76192 and 76292, were drilled to depths of twenty and twenty-two and a half feet, respectively. Samples were collected from the soil borings prior to the development of monitoring wells. Samples were analyzed for VOCs, SVOCs, metals and radionuclides.

IHSS's 166.1-3 (Trenches A, B, C) - Twenty-six borings were drilled to five feet below the bottom of each trench. Eight borings were drilled in Trench A, seven borings in Trench B and six and five in the western and eastern components of Trench C, respectively. Samples were analyzed for VOCs, metals and radionuclides.

IHSS's 167.1 and 167.3 (North and South Area Spray Fields) - Thirty-four borings were drilled to depths of four feet. Twenty-five borings were drilled in the North Spray field. Nine soil borings were drilled in the South Area Spray Field. The soil borings were sampled in two-foot intervals. Samples were analyzed for TOC, metals and radionuclides.

IHSS 216.1 (East Spray Field Area) six soil borings were drilled to depths of four feet. The soil borings were sampled in two foot intervals. Samples were analyzed for TOC, total metals and radionuclides.

Groundwater

Groundwater samples were collected from RFP monitoring wells on a quarterly basis under a plant-wide groundwater sampling program. The plant-wide monitoring program included 2 monitoring wells installed during the OU-6 Phase I investigation, and wells installed during other investigations conducted from 1991 through 1993.

The data used for evaluation of contaminant concentrations in OU-6 were taken from samples collected from the first quarter of 1991 through the fourth quarter of 1993. The number of groundwater samples collected by chemical group were: 279 volatile organic compounds (VOCs) (11 analyzed by method 502.2, 22 analyzed by method 524.2, 246 analyzed by method VOACL_P), 14 semivolatile organic compounds (SVOCs) (all analyzed by method BNACL_P), 11 pesticides/PCBs (all analyzed by PESTCL_P), 191 filtered metals, 107 unfiltered metals, 172 filtered radionuclides, 138 unfiltered radionuclides, and 279 water quality parameters (WQPLs).

Sediments

Stream Sediments

Stream sediments were collected using a 2-inch diameter core sampler with a hand driver. Samples were collected to a depth of 2 feet in the stream channels of the A and B Series Detention Ponds. The sample within the tool cavity is then emptied into a stainless steel container for compositing using a stainless steel scoop.

The data used for evaluation of contaminant concentrations in stream sediments were from 15 samples. Stream sediments were collected in May 1993 during the OU-6 Phase I investigation. The samples were analyzed for VOCs, SVOCs, pesticide/PCBs, metals, radionuclides and WQPLs.

Dry Sediments

Dry sediments were collected using the RFP soil sampling method. The RFP method consists of driving a stainless steel jig (10" x 10" x 5") into undisturbed soil. The sample within the tool cavity is then collected using a stainless steel scoop and placed in a stainless steel container for compositing. Under the RFP method, ten subsamples are used for compositing from the corners and the center of two 1-meter squares, spaced one meter apart. After the ten subsamples are collected, the sample material is composited. The dry sediment samples were collected in the floodplains of the A and B series ponds, not the stream channels.

The data used for evaluation of contaminant concentrations in dry sediments were from 18 samples collected in February 1993. The samples were analyzed for SVOCs, pesticide/PCBs, metals, radionuclides and WQPLs.

Pond Sediments

Pond sediments were collected by the RFP site-wide surface water program. Each pond was sampled at five locations. One of the five sediment samples was collected from within 5 feet of each pond inlet. The second sample was collected from the deepest part of each respective pond. The other three samples were collected at random locations within each pond. Samples were collected in two-foot depth intervals. If the sediment depth was greater than 2 feet, an additional sample was collected from two to four feet. Among the ten ponds, seven samples were collected in the two to four-foot interval. Each sample collected was a composite of the 2 foot interval.

The data used for evaluation of contaminant concentrations in pond sediments were from 62 samples. The samples were collected during the fourth quarter of 1992. Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, radionuclides and WQPL.

Pond Surface Water

The RFP site-wide surface water sampling program collected the pond surface water samples. Five surface water samples were collected from each of the four A Series Detention Ponds and five B Series Detention Ponds and the Walnut and Indiana Pond. One of the five samples was collected from the deepest part of the pond. A second sample was collected from within five feet of the inlet. The third sample was collected within five feet of the pond spillway. The two remaining samples were collected randomly. Data used to evaluate OU-6 contamination in pond surface water samples were collected in the third and fourth quarter of 1992. Samples were analyzed for VOCs, SVOCs, pesticide/PCBs, filtered metals, unfiltered metals, filtered radionuclides, unfiltered radionuclides and WQPL.

2.2.2 Data Reviewing and Editing

The OU-6 field program began August of 1992 and was completed in May 1993. A total of 103,000 records were reported for OU-6. Ninety-two percent of the data for OU-6 has been validated, totaling 95,000 records. The process described below are the steps taken to review and edit the OU-6 data.

Monthly data averages were received from the Rocky Flats Environmental Data System (RFEDS) until January 15, 1994. The data deliveries were segregated by validated and nonvalidated data. After the last delivery it was determined which data records were missing or had not been validated. Then the data records identified as being received but not validated were added to the validated data set.

A complete data set for OU-6, with the exception of unreported results as of January 15, 1994, is included in the OU-6 Phase I Report. In total, ninety-five records were not received. Thirty-one of these records were from samples cited as insufficient sample volume (all were for radionuclides). Fifteen of these records were from samples received by the laboratory and not yet analyzed (all of these samples are lab replicates for radionuclides). Twenty-three records are missing because samples were lost during shipment to the lab (three radionuclide samples comprise fifteen of these records).

The next step in the data evaluation process was to remove quality control samples, such as equipment rinsates. The blanks, spikes, and surrogates were removed by RFEDS.

Data records were checked for multiple records. When multiple records were identified, RFEDS personnel were consulted to assist in determination of appropriate records to keep and use in the report.

After the multiple record check, any R-qualified (rejected) data were removed from the data files. For OU-6, 555 records were rejected (radionuclide analytes comprised 233 of the rejected records). This represents less than one percent of the data.

Field duplicates and the associated real sample were identified and averaged. This average result replaced the reported result for the real sample. An asterisk has been attached to reported result to designate the reported real result is an averaged result of the real and associated field duplicate.

The following data laboratory qualifiers were reported:

The B qualifier for a metal result signifies that the reported concentration is greater than the instrument detection limit (IDL) but less than the contract required detection limit (CRDL) for that analyte. These data were used as reported.

The B qualifier for organics indicates the analyte was found in the method blank and the real sample. These data were used as reported.

E-qualified data (exceeded the calibration range) were replaced with the associated D-qualified data (diluted to within calibration range), if the D-qualified record was received. In many cases only the E-qualified record was reported, in this case the data was used as reported.

R-qualified data (not usable according to EPA criteria) were eliminated. R-qualified results represent a small portion of the organic and inorganic data, but a larger percentage of the radionuclide records. The R-qualified data appear only in data that has been validated.

Analytical results were J-qualified if the analyte was positively identified below the quantitation limit. The result was considered an estimate because of the uncertainty associated with detected concentration at low levels. Data qualified with a J were used as reported.

A U qualifier assigned to an analytical result indicates that the analyzed chemical was not detected above the sample quantitation limit. The U qualifier was the primary mechanism used for evaluating detection frequency for the organic and inorganic constituents. The U-qualified data were used as nondetects for detection frequency determination, but one-half the reporting limit was used as the concentration in the statistical evaluations (background comparison).

For radionuclides, negative values were used as reported, therefore, there were no radionuclide non-detects.

2.3 BACKGROUND COMPARISON FOR INORGANIC COMPOUNDS

Analytical results for metals and radionuclides were compared to background levels derived from data for subsurface soils, groundwater, seeps/springs, and stream sediment reported in the Background Geochemical Characterization Report (DOE 1993) and from background surface soil samples collected in the Rock Creek area during the 1991 OU-1 Phase III investigation and the 1993 OU-2 Phase II investigation. Metals and radionuclides whose concentrations did not exceed background levels were eliminated from further consideration as potential chemicals of concern.

Appendix A presents the background comparison methodology in detail and contains summary tables of statistical results for metals and radionuclides in all media. The criteria used to evaluate whether a metal or radionuclide exceeded background levels are summarized here.

- a Analytical results for metals and radionuclides were compared to the background data using four statistical tests: the Quantile test, Slippage test, Student's t-test, and the Gehan test as described in the letter report of Gilbert (Gilbert 1993). Test conditions and treatment of nondetect values are

discussed in Appendix A. The analyte was considered to be above background if it failed any test at the $p \leq 0.05$ level.

- b. **UTL_{99/99} Comparison** Analytical results for each metal and radionuclide were compared to the 99 percent upper tolerance limit of background data calculated at the 99 percent confidence level (UTL_{99/99}). The UTL_{99/99} test is an indicator of possible hot spots (Gilbert 1993), but with large sample sizes of one to two hundred, it is to be expected that one or two data points would exceed the UTL_{99/99} value. Nevertheless, if any result exceeded the UTL_{99/99}, the analyte was identified as a potential chemical of concern.

Some analytes did not fail any of the four statistical tests (that is, no significant statistical difference from background was found), but they were identified as potential chemicals of concern solely on the basis of one or more results exceeding the UTL_{99/99} of background. In this case, if three or more results exceeded the UTL_{99/99}, the analyte was retained for evaluation in the concentration/toxicity screens for identification of OU-wide chemicals of concern (see Section 2.6). If only one or two results exceeded the UTL_{99/99}, but no statistical difference from background was found, the analyte was retained for "hot spot" evaluation in the risk-based screen described in Section 2.8.

2.4 ESSENTIAL NUTRIENT SCREEN

Calcium, iron, magnesium, potassium, and sodium were eliminated from further consideration as chemicals of concern because they are essential nutrients, they occur naturally in the environment, and they are toxic only at very high doses. Anions in groundwater other than nitrates were also not evaluated further.

2.5 FREQUENCY OF DETECTION

All detected organic compounds and metals above background levels were evaluated for frequency of detection. Compounds that were detected at a frequency of 5 percent or greater were considered potential OU-wide chemicals of concern. These compounds were included in concentration/toxicity screens to identify compounds that could contribute significantly to total risk (see Section 2.6). Compounds detected at less than 5 percent frequency can be

eliminated from further consideration because the compound is not characteristic of site contamination and the potential for exposure is low. Nevertheless, maximum concentrations of infrequently detected organic compounds and metals were compared to risk-based concentrations as described in Section 2.8 to identify isolated or highly localized occurrences of high concentrations of toxic chemicals (i.e., hot spots) that could pose a risk if routine exposure were to occur. These chemicals were retained as "special case" chemicals of concern for evaluation in the risk assessment. Since there were no non-detect results for radionuclides (negative values were used as reported), they were considered to be detected at 100 percent frequency.

2.6 CONCENTRATION/TOXICITY SCREEN

Chemicals of concern were selected using concentration/toxicity screens for noncarcinogens, carcinogens, and radionuclides. The screens included each organic chemical detected and inorganics above background levels, detected at 5 percent frequency or greater, in each medium of concern. The purpose of applying the screen is to focus the risk assessment on the chief contributors to potential risk. To perform the screen, each chemical in a medium (such as groundwater) is scored according to its maximum detected concentration and toxicity to obtain a risk factor. The risk factor for noncarcinogenic effects is the maximum detected concentration divided by the EPA Reference Dose (RfD) for that chemical. The risk factor for carcinogenic effects (and for radionuclides) is the maximum detected concentration (activity) multiplied by the EPA cancer slope factor (SF) for that chemical (and radionuclide). The chemical-specific risk factors are summed to calculate total risk factors for the noncarcinogenic, carcinogenic, and radioactive chemicals of potential concern in each medium. The ratio of the risk factor for each chemical to the total risk factor is called a risk index and approximates the relative risk associated with each chemical in the medium. Separate concentration/toxicity screens are performed for carcinogenic and noncarcinogenic effects of organic compounds and metals and for carcinogenic effects of radionuclides.

Each chemical that comprised 1 percent or more of the total risk factor was considered a chemical of concern for evaluation in the quantitative risk assessment. This approach reduces the number of chemicals to be carried through a risk assessment. However, the approach is conservative (health protective) because it retains some chemicals that contribute

as little as 1 percent of the total potential risk. In most cases, only a few chemicals contribute the majority of potential risk in each medium.

EPA-recommended toxicity factors (RfDs and cancer SFs) were used in the concentration/toxicity screens. SFs and RfDs were determined from IRIS (EPA 1994), HEAST (EPA 1993) and other EPA sources if available. The toxicity factors used in the screens are listed in Tables 2-1 and 2-2.

EPA-established toxicity factors are not available for some of the potential chemicals of concern. Therefore, these analytes cannot be included in the concentration/toxicity screens, in other toxicity-based screens, or in the quantitative risk assessment. OU-6 contaminants without toxicity factors were identified for each medium and are listed in each section. The potential impact of these compounds on overall risk will be addressed qualitatively in the human health risk assessment.

2.7 APPLICATION OF PROFESSIONAL JUDGMENT

Professional judgment was used at three points in the process of selecting chemicals of concern for health risk assessment.

1. Background UTL_{99/99} comparison. The background UTL_{99/99}s presented in the Background Geochemical Characterization Report (DOE 1993) were calculated assuming that the background data were normally distributed. This assumption may not be appropriate for all analytes. Concentrations of some analytes were within background range according to all statistical tests performed but one or two results exceeded the background UTL_{99/99}. This resulted in identifying the analyte as a potential chemical of concern. For some of these analytes, the distribution of the background data were tested. If the better fit was to a log normal distribution, the UTL_{99/99} was recalculated based on log-normal distribution and the site results were compared to the log-normal-based UTL_{99/99}. This resulted in removing some analytes as potential chemicals of concern. These are noted in the tables in Appendix A.

- 2 Percent of total risk factor In the concentration/toxicity screens, chemicals contributing somewhat less than 1 percent of the total risk factor were retained as OU-wide chemicals of concern

- 3 Spatial/temporal and geochemical evaluation The spatial and temporal distribution and geochemical characteristics of certain metals and radionuclides identified as being above background levels were evaluated to support a conclusion as to whether they were likely to be naturally occurring or due to environmental contamination For example, manganese in groundwater was concluded to be naturally occurring based on spatial, temporal, and geochemical evaluation This judgment process resulted in removing several metals and radionuclides as potential chemicals of concern All such professional judgment is described in each section, where relevant

2.8 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Chemicals detected infrequently (in less than 5 percent of all samples in the medium) can usually be eliminated from consideration as chemicals of concern because they are not characteristic of site contamination and the potential for exposure is low. However, these compounds were further screened so as not to neglect an infrequently detected compound that could contribute significantly to risk if routine exposure to a hot spot were to occur. In this analysis, maximum measured concentrations were compared to screening levels equivalent to 1000 x risk-based preliminary remediation goals (PRGs) (DOE 1994). This analysis is summarized below and is presented in detail in Appendix B.

For screening purposes, PRGs were defined as chemical concentrations associated with an excess cancer risk of 10^{-6} (1 in 1 million) or a hazardous index for noncarcinogenic effects of 1, assuming residential exposures. Any infrequently detected chemicals measured at a concentration greater than 1000 times the respective PRG was identified as representing a potentially significant health threat if exposure were to occur and was included in the list of "special case" chemicals of concern for evaluation in the risk assessment.

PRGs were calculated (DOE 1994) assuming a residential exposure scenario and using standard toxicity values (RfDs and SFs) published by EPA. Chemicals in surface and subsurface soils were calculated assuming multiple pathway exposure (ingestion, dermal contact, and inhalation of particulates). PRGs for chemicals in groundwater were calculated based on ingestion only, since this was assumed to be the chief groundwater exposure route. The exposure parameters used to calculate PRGs are presented in Appendix B.

2.9 IDENTIFICATION OF CHEMICALS OF CONCERN

OU-wide chemicals of concern were identified on the basis of the background comparison and application of the concentration/toxicity screens. Special-case (hot spot) chemicals of concern were identified using the risk-based PRG screen for infrequently detected compounds. OU-wide and special-case chemicals of concern for each medium are summarized in each section of this memorandum.

TABLE 2-1
ROCKY FLATS OU-6
TOXICITY FACTORS FOR
ORGANIC COMPOUNDS AND METALS

Analyte	Slope Factors 1/(mg/kg-day)		EPA Cancer Weight of Evidence	Reference Doses mg/kg-day		Reference Concentration mg/m ³
	Oral	Inhalation		Oral	Inhalation (*)	
1 1 Dichloroethane			C	1 0E 01 (2)	1 40E 01	5 0E 01 (3)
1 1 Dichloroethene	6 0E 01 (1)	1 7E 01 (1)	C	9 0E 03 (1)		
1 2 4 Trichlorobenzene				1 0E 02 (1)	3 00E-03	9 0E 03 (3)
1 2-Dichloroethane	9 1E 02 (1)	9 1E-02 (1)	B2			
1 2 Dichloroethene				9 0E 03 (2)		
1 2 Dimethylbenzene (o-xylene)				2 0E+00 (1)		
cis 1 2-Dichloroethene				1 0E-02 (2)		
1 3 Dimethylbenzene (m xylene)				2 0E+00(1)		
1 4 Dichlorobenzene	2 4E 02 (2)		C		2 30E-01	8 0E 01 (2)
2 Butanone			D	6 0E 01 (1)	3 00E 01	1 0E+00 (1)
2-Chlorophenol				5 0E-03 (1)		
4-Methyl 2 pentanone				5 0E 02 (2)	2 30E 02	8 0E 02 (3)
4-Methylphenol				5 0E-03 (6)		
Acenaphthene				6 0E-02 (1)		
Acetone				1 0E-01 (1)		
Aldrin	1 7E+01 (1)	17 1E+00 (1)	B2	3 0E-05 (1)		
Aluminum		-		2 9E+00 (6)	-	
Anthracene		-		3 0E-01 (1)		
Antimony				4 0E-04 (1)		
Arsenic	1 7E+00 (7)	1 5E+01 (7)	A	3 0E-04 (1)		
Barium				7 0E 02 (1)	1 40E 04	5 0E 04 (3)
Benzene	2 9E-02 (1)	2 9E-02 (1)	A			
Benzo(a)anthracene	7 3E-01 (4)		B2		-	
Benzo(a)pyrene	7 3E+00 (4)		B2			
Benzo(b)fluoranthene	7 3E 01 (4)		B2			
Benzo(k)fluoranthene	7 3E 02 (4)		B2			
Benzoic acid	-			4 0E+00 (1)		
Benzyl alcohol				3 0E 01 (2)		
Beryllium	4 3E+00 (1)	8 4E+00 (1)	B2	5 0E 03 (1)		
Bis(2-ethylhexyl)phthalate	1 4E-02 (1)		B2	2 0E 02 (1)		
Butylbenzene (sec tert)				1 0E 02 (6)		
Butyl benzylphthalate			C	2 0E 01 (1)		
Cadmium (food)		6 3E+00 (1)	B1	1 0E 03 (1)		
Cadmium (water)			B1	5 0E 04 (1)		
Carbon disulfide				1 0E 01 (1)	2 90E 03	1 0E 02 (2)
Carbon tetrachloride	1 3E 01(1)	5 2E 02 (1)	B2	7 0E-04 (1)		
Chlorobenzene				2 0E 02 (1)	5 70E 03	2 0E 02 (3)
Chloroform	6 1E 03 (1)	8 0E-02 (1)	B2	1 0E 02 (1)		
Chromium III				1 0E+00 (1)		
Chrysene	7 3E 02 (4)		B2			
Cobalt				1 8E-01 (6)		
Di n butylphthalate			D	1 0E 01 (1)		
Di n-octylphthalate			D	2 0E 02 (2)		
Dibenzo(a,h)anthracene	7 3E+00 (4)		B2			
Diethyl phthalate				8 0E 01 (1)		
Ethylbenzene			D	1 0E-01 (1)	3 00E 01	1 0E+01 (1)

TABLE 2-1
(Concluded)

Analyte	Slope Factors		EPA Cancer Weight of Evidence	Reference Doses		RfC
	Oral	Inhalation		Oral	Inhalation (*)	
Fluoranthene				4 0E 02 (1)		
Fluorene				4 0E-02 (1)		
gamma BHC				3 0E 04 (1)		
Heptachlor epoxide	9 1E+00 (1)	9 1E+00 (1)	B2	1 3E 05 (1)		
Indeno(1 2 3-cd)pyrene	7 3E 01 (4)		B2			
Lithium				2 0E 02 (6)		
Manganese (food)			D	1 4E 01 (1)	1 40E 05	5 0E 05 (1)
Manganese (water)			D	5 0E 03 (1)		
Mercury			D	3 0E 04 (2)	9 00E 05	3 0E-04 (2)
Methylene chloride	7 5E-03 (1)	1 6E-03 (1)	B2	6 0E 02 (1)	9 00E 01	3 0E+00 (2)
Molybdenum				5 0E-03 (1)		
Naphthalene				4 0E-02 (6)		
Nickel		8 4E 01 (1)	A	2 0E 02 (1)		
Nitrate				1 6E+00 (1)		
Pentachlorophenol	1 2E 01(1)		B2	3 0E-02 (1)		
Phenol			D	6 0E 01 (1)		
Polychlorinated biphenyls	7 7E+00 (1)		B2			
Pyrene		-	D	3 0E-02 (1)		-
Selenium				5 0E 03 (1)		
Silver			D	5 0E 03 (1)		
Strontium		-		6 0E-01 (1)		
Styrene				2 0E 01 (1)	2 80E+00	1 0E+01 (1)
Tetrachloroethene	5 2E 02 (5)	2 0E 03 (5)	B2	1 0E 02 (1)		
Thallium (oxide)				7 0E 05 (2)		
Tin				6 0E 02 (2)		
Toluene			D	2 0E 01 (1)	1 10E-01	4 0E 00 (1)
Trichloroethene	1 1E 02 (5)	6 0E-03 (5)	B2			
Xylene p-**			-	2 0E+00 (1)		
Vanadium				7 0E 03 (2)		
Zinc	-		D	3 0E 01 (1)		

Sources

(1) = IRIS

(2) = HEAST 1993 and Supplement (EPA 1993a)

(3) = HEAST 1993 Table 2 (EPA 1993a)

(4) = (EPA 1993b)

(5) = Joan S. Dollard et al. Superfund Health Risk Technical Support Center. Carcinogenicity Characterization of Perchloroethylene (PERC) and Trichloroethylene (TCE) (Luke Air Force Base, Arizona). ECAO

(6) = Provisional values for aluminum, butylbenzene, cobalt, lithium, and naphthalene. USEPA. ECAO

(7) = Converted from IRIS unit risks. Oral proposed U R = 5 00E-05/ug/L. Inhalation U R = 4 30E-03/ug/m3

Oral SF = 5 00E 05 x 1000ug/mg x 70kg/2L. Inhalation SF = 4 30E-03/ug/m3 x 1000ug/mgx70kg/20m3

* Calculated from RfC. RfD = RfC x 20m3/day/70kg

** o- and m-xylenes are listed as 1,2- and 1,3-dimethylbenzene

TABLE 2-2
ROCKY FLATS PLANT OU-6
SLOPE FACTORS
FOR RADIONUCLIDES

Analyte	Oral (Risk/pCi)	Inhalation (Risk/pCi)	External (Risk/yr/pCi/g)	EPA Cancer Weight of Evidence
Americium-241	2.4E-10	3.2E-08	4.9E-09	A
Cesium-137 +D	2.8E-11	1.9E-11	2.0E-06	A
Plutonium-239	2.3E-10	3.8E-08	1.7E-11	A
Plutonium-240	2.3E-10	3.8E-08	2.7E-11	A
Radium-226 +D	1.2E-10	3.0E-09	6.0E-06	A
Radium-228 +D	1.0E-10	6.6E-10	2.9E-06	A
Strontium-89	3.0E-12	2.9E-12	4.7E-10	A
Strontium-90 +D	3.6E-11	6.2E-11	0.0E+00	A
Tritium	5.4E-14	7.8E-14	0.0E+00	A
Uranium-233,234 *	1.6E-11	2.6E-08	3.0E-11	A
Uranium-235 +D	1.6E-11	2.5E-08	2.4E-07	A
Uranium-238 +D	2.8E-11	5.2E-08	3.6E-08	A

Source HEAST 1993 (EPA 1993a)

* = Slope factors shown are for U-234

+D = Risks from radioactive decay products included

TABLE 2-4
OU-6 PHASE I RFI/RI ANALYTICAL PARAMETERS

TARGET ANALYTE LIST (TAL) - METALS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Cyanide
Iron, Total, Dissolved
Lead
Magnesium
Manganese, Total Dissolved
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc

ADDITIONAL - METALS

Cesium
Lithium
Molybdenum
Silicon
Strontium
Tin

**GRAPHITE FURNACE ATOMIC ABSORPTION
(GFAA) - METALS**

Cadmium
Copper
Iron Total
Lead
Manganese
Silver
Zinc

TARGET COMPOUND LIST (TCL) - VOCs

Chloromethane
Bromomethane
Vinyl chloride
Chloroethane
Methylene chloride
Acetone
Carbon disulfide
1,1-Dichloroethene
1,1-Dichloroethane
total 1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon tetrachloride
Vinyl acetate
Bromodichloromethane
1,1,2,2-Tetrachloroethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
trans-1,3-Dichloropropene
Bromoform
2-Hexanone
4-Methyl-2-pentanone
Tetrachloroethene
Toluene
Chlorobenzene
Ethyl benzene
Styrene
Total xylenes

TCL - SVOCs

Phenol
bis(2-Chloroethyl)ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl alcohol

TABLE 2-4
(continued)

1,2-Dichlorobenzene	Pyrene
2-Methylphenol	Butylbenzylphthalate
bis(2-Chloroisopropyl)ether	3,3'-Dichlorobenzidine
4-Methylphenol	Benzo(a)anthracene
N-Nitroso-di-n-dipropylamine	Chrysene
Hexachloroethane	bis(2-Ethylhexyl)phthalate
Nitrobenzene	Di-n-octylphthalate
Isophorone	Benzo(b)fluoranthene
2-Nitrophenol	Benzo(k)fluoranthene
2,4-Dimethylphenol	Benzo(a)pyrene
Benzoic acid	Indeno(1,2,3-cd)pyrene
bis(2-Chloroethoxy)methane	Dibenz(a,h)anthracene
2,4-Dichlorophenol	Benzo(g,h,i)perylene
1,2,4-Trichlorobenzene	
Naphthalene	TCL - PESTICIDES/PCBs
4-Chloroaniline	alpha-BHC
Hexachlorobutadiene	beta-BHC
4-Chloro-3-methylphenol	delta-BHC
(para-chloro-meta-cresol)	gamma-BHC (Lindane)
2-Methylnaphthalene	Heptachlor
Hexachlorocyclopentadiene	Aldrin
2,4,6-Trichlorophenol	Heptachlor epoxide
2,4,5-Trichlorophenol	Endosulfan I
2-Chloronaphthalene	Dieldrin
2-Nitroaniline	4,4'-DDE
Dimethylphthalate	Endrin
Acenaphthylene	Endosulfan II
2,6-Dinitrotoluene	4,4'-DDD
3-Nitroaniline	Endosulfan sulfate
Acenaphthene	4,4'-DDT
2,4-Dinitrophenol	Methoxychlor
4-Nitrophenol	Endrin ketone
Dibenzofuran	alpha-Chlordane
2,4-Dinitrotoluene	gamma-Chlordane
Diethylphthalate	Toxaphene
4-Chlorophenyl phenyl ether	Aroclor-1016
Fluorene	Aroclor-1221
4-Nitroaniline	Aroclor-1232
4,6-Dinitro-2-methylphenol	Aroclor-1242
N-Nitrosodiphenylamine	Aroclor-1248
4-Bromophenyl phenyl ether	Aroclor-1254
Hexachlorobenzene	Aroclor-1260
Pentachlorophenol	
Phenanthrene	
Anthracene	
Di-n-butylphthalate	
Fluoranthene	

TABLE 2-4
(continued)

RADIONUCLIDES

Gross Alpha
Gross Beta
Uranium 233+234, 235, and 238
(each species)
Americium 241
Plutonium 239/240
Tritium
Cesium 137 Total
Strontium 89 + 90 Total

TOTAL ORGANIC CARBON (TOC)
NITRATE/NITRITE AS N

Parameters Exclusively for Groundwater Samples

FIELD PARAMETERS

pH
Specific Conductance
Temperature
Dissolved Oxygen
Barometric Pressure

WATER QUALITY PARAMETER LIST (WQPL)

Chloride
Fluoride
Sulfate
Carbonate
Bicarbonate
Total Dissolved Solids
Total Suspended Solids

ADDITIONAL PARAMETERS FOR IHSS
142 1-9 AND 12 WATER SAMPLES

DOC
Silicon
Alkalinity



RFSCA2

SURFACE SOIL CHEMICALS OF CONCERN

3.1 SURFACE SOIL DATA SET

Chemicals of concern in surface soil were selected using data collected at all OU-6 IHSSs at which surface soil samples were collected except the Old Outfall (IHSS 143). The Old Outfall was excluded because it is proposed to omit this IHSS from the OU-wide baseline human health risk assessment. The outfall is a small site located well below ground surface in the industrialized zone distant from other OU-6 IHSSs, soils at the site are fill brought in for grading, and future action will in part be dictated by its location in the industrialized zone of the plant. Although a baseline risk assessment is not proposed for IHSS 143, a separate risk-based evaluation will be performed using a PRG screen for all detected analytes above background levels. Consequently, surface and subsurface soil samples from the Old Outfall were excluded from the data set for selecting OU-wide chemicals of concern.

The data set includes 119 surface soil samples that were analyzed for metals and anywhere from 18 to 125 samples analyzed for various radionuclides. In addition, 55 surface soil samples at the Sludge Dispersal Area (IHSS 141) and the Triangle Area (IHSS 165) were analyzed for pesticides/PCBs. The sampling and analytical program is summarized in Tables 2-3 and 2-4. Sample sizes for each analyte are listed in the Background Comparison Summary Tables in Appendix A.

3.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Tables 3-1 and 3-2 summarize the maximum detected concentrations, detection frequencies, and results of the background comparison for metals in OU-6 surface soil samples. The statistical comparisons to background data are presented in detail in Appendix A. Only molybdenum was detected at less than 5 percent frequency. Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 3-5.

Background surface soil data consist of analytical results from samples collected at 18 locations in the Rock Creek area. Nine of the sites were sampled in February 1992 and the remaining nine sites were sampled in March 1993. All surface soil samples at background and OU-6 sampling locations were collected using the RFP method, a composite method in which the top 2 inches of soil are collected.

Metals and radionuclides above background levels and detected at 5 percent or greater detection frequency were included in concentration/toxicity screens to select OU-wide chemicals of concern, with the following exceptions:

Analytes Excluded as OU-Wide Potential Chemicals of Concern

Analyte	Statistically > Background? ⁽¹⁾	Background UTL _{99/99}	No. Results > UTL _{99/99}	Maximum Concentration
Chromium	No	24.8 mg/kg	1	35.1 mg/kg
Silver	No	10 mg/kg	1	52.7 mg/kg
U-233,234	No	1,826 pCi/g	1	2.02 pCi/g

⁽¹⁾ See Appendix A.

In each case, only one sample result exceeded the background UTL_{99/99}. However, none were significantly different than background according to the statistical tests described in Appendix A. Because only a single result exceeded background range, these analytes were rejected as potential OU-wide chemicals of concern but were included in the risk-based PRG screen to identify special case chemicals of concern (Appendix B).

3.3 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for surface soils are presented in Tables 3-3 through 3-5. All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern. In addition, two metals that each contribute 0.9 percent of the total risk factor are also retained as chemicals of concern. OU-wide chemicals of concern are listed below and in Table 3-7.

OU-Wide Chemicals of Concern Surface Soil

Antimony
Mercury
Nickel
Vanadium
Zinc
Plutonium-239,240
Americium-241

Compounds detected above background levels that do not have EPA-established toxicity factors are listed in Table 3-6. Copper and lead were detected above background levels in surface soils but do not have EPA toxicity factors and, therefore, cannot be evaluated in a toxicity- or risk-based screen. The potential contribution of these metals to overall risk will be evaluated qualitatively in the risk assessment.

3.4 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Maximum concentrations of Aroclor-1254 and molybdenum (each detected at 1 percent frequency) and of chromium, silver and uranium-233/234 (as explained in Section 3.2) were compared to values equivalent to 1000 times the chemical-specific PRGs. The PRGs were calculated assuming residential exposure to surficial soil and are used to identify special case chemicals of concern that could pose a health risk if exposure were to occur in a highly localized area. The screen is discussed in Appendix B and the results for surficial soil are presented in Table B-1.

None of the maximum concentrations of chemicals detected at low frequency in surficial soil exceeded the 1000 times PRG value. Therefore, there are no special case chemicals of concern in surface soils for OU-6.

TABLE 3-1
ROCKY FLATS PLANT OU-6
METALS DETECTED AT 5% OR GREATER FREQUENCY
SURFACE SOIL⁽¹⁾

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Aluminum	24100	100	No
Antimony	43 6	47	Yes
Arsenic	11	100	No
Barium	272	100	No
Beryllium	1 5	90	No
Cadmium	6 4	41	No
Cesium	35 4	86	No
Chromium	35 1	99	Yes
Cobalt	20 3	100	Yes
Copper	61 6	100	Yes
Lead	68 7	100	Yes
Lithium	18 1	95	No
Manganese	823	100	No
Mercury	0 34	41	Yes
Nickel	22 5	95	Yes
Selenium	1 3	35	No
Silver	52 7	8	Yes
Strontium	255	100	Yes
Thallium	0 55	44	No
Tin	38 7	5	No
Vanadium	75 9	100	Yes
Zinc	650	100	Yes

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 3-2
ROCKY FLATS PLANT OU-6
METALS AND PESTICIDES DETECTED AT
LESS THAN 5% FREQUENCY
SURFACE SOIL⁽¹⁾

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Aroclor-1254	0 425	1	
Molybdenum	9 9	1	Yes

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 3-3
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SURFACE SOIL⁽¹⁾
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Antimony	43.6	n/a	4.0E-04	1.1E+05	8.7E-01	87.3
Vanadium	75.9	n/a	7.0E-03	1.1E+04	8.7E-02	8.7
Zinc	650	n/a	3.0E-01	2.2E+03	1.7E-02	1.7
Mercury	0.34	n/a	3.0E-04	1.1E+03	9.1E-03	0.9
Nickel	22.5	n/a	2.0E-02	1.1E+03	9.0E-03	0.9
Strontium	255	n/a	6.0E-01	4.3E+02	3.4E-03	0.3
Cobalt	20.3	n/a	1.8E-01	1.1E+02	9.0E-04	0.1
Total Risk Factor				1.2E+05		

RfDs are in units of mg/kg-day

n/a = not available

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 3-4
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SURFACE SOIL⁽¹⁾
CARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Nickel	22.5	8.4E-01	n/a	--	--	--
Total Risk Factor				0.0E+00		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 3-5
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SURFACE SOIL⁽¹⁾
RADIONUCLIDES

Chemical	Maximum	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
	Detected onc (mg/kg)					
Plutonium-239 240	15 22	3 8E-08	2 3E-10	3 5E-09	8 2E-01	81 8
Americium-241	3 243	3 2E-08	2 4E-10	7 8E-10	1 8E-01	18 2
Total Risk Factor				4 3E-09		

Slope factors are in units of 1/pCi

* Inhalation pathway is considered relatively minor in outdoors compared to direct ingestion factors were used to calculate the risk factor

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 3-6
ROCKY FLATS PLANT OU-6
METALS ABOVE BACKGROUND
WITHOUT EPA TOXICITY FACTORS
SURFACE SOIL

Copper
Lead

TABLE 3-7
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONCERN
SURFACE SOIL

OU-Wide	
	Antimony
	Mercury
	Nickel
	Vanadium
	Zinc
	Americium-241
	Plutonium-239/240

¹ Excluding Old Outfall (IHSS 143)

SUBSURFACE SOIL CHEMICALS OF CONCERN

4.1 SUBSURFACE SOIL DATA SET

Chemicals of concern in subsurface soil were selected using data collected at all OU-6 IHSSs where subsurface soil samples were collected except the Old Outfall (IHSS 143) because it is proposed to omit this IHSS from the baseline risk assessment. The rationale for omitting this IHSS from the OU-wide baseline risk assessment was explained in Section 3.0. Subsurface soil samples from the Old Outfall were therefore excluded from the data set for selecting OU-wide chemicals of concern.

Over 200 subsurface soil samples were analyzed for metals and radionuclides. Approximately 380 samples were analyzed for volatile organic compounds. Semivolatile organic compounds were also analyzed for in 34 samples collected at the Triangle Area (IHSS 165). The sampling and analytical program at each IHSS is summarized in Tables 2-3 and 2-4.

4.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Tables 4-1 and 4-2 summarize the maximum detected concentrations, detection frequencies, and results of background comparison in OU-6 subsurface soil samples. Background data for subsurface soils were taken from the Background Geochemical Characterization Report (DOE 1993). The statistical comparisons of inorganic results to background data are presented in detail in Appendix A.

Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 4-5.

Analytes above background levels that were detected at 5 percent or greater detection frequency were included in concentration/toxicity screens to select OU-wide chemicals of concern, with the following exceptions:

Analytes Excluded as OU-Wide Potential Chemicals of Concern

Analyte	Statistically > Background ⁽¹⁾	Background UTL _{99/99}	No Results > UTL _{99/99}	Maximum Concentration
Vanadium	No	112 8 mg/kg	1/231	118 mg/kg
U-238	No	1 807 pCi/g	2/230	141 pCi/g

⁽¹⁾ See Appendix A

For these analytes, only one or two sample results exceeded the background UTL_{99/99}. However, neither analyte was significantly different than background according to the statistical tests described in Appendix A. Therefore, these analytes were removed as potential OU-wide chemicals of concern in subsurface soil but were included in the risk-based PRG screen to identify special case chemicals of concern (Appendix B).

4.3 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for subsurface soils are presented in Tables 4-3 through 4-5. All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern for quantitative risk assessment. In addition, uranium-235 was also retained because it contributed nearly 1 percent of the total risk factor for radionuclides. Chemicals of concern are listed below and in Table 4-7.

OU-Wide Chemicals of Concern Subsurface Soil

Benzo(a)pyrene
Benzo(b)fluoranthene
Methylene chloride
Barium
Strontium
Zinc
Plutonium-239,240
Americium-241
Uranium-235

Chemicals of potential concern that do not have EPA-established toxicity factors are listed in Table 4-6. In subsurface soils, these are lead and phenanthrene. These compounds cannot be evaluated in a toxicity- or risk-based screen to select chemicals of concern. However, their potential contribution to overall risk will be evaluated qualitatively in the risk assessment for OU-6.

4.4 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Maximum concentrations of 17 VOCs and SVOCs (detected at < 5 percent frequency) and of vanadium and uranium-238 (as explained in Section 4.2) were compared to values equivalent to 1000 times the chemical-specific PRGs. Although these chemicals were detected in subsurface soil where exposure potential is limited, the PRGs used in this screening evaluation were calculated assuming long-term residential exposure to surficial soil. This approach is extremely conservative, since it assumes a 30 year exposure to chemicals in subsurface soil. The PRGs are used to identify special case chemicals of concern that could pose a health risk if exposure were to occur in a highly localized area. The screen is discussed in Appendix B and the results for subsurface soil are presented in Table B-2.

None of the maximum concentrations of chemicals detected at low frequency in subsurface soil exceeded the 1000 times PRG value. Therefore, no special case chemicals of concern were identified for subsurface soils.

TABLE 4-1
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND METALS DETECTED AT
5% OR GREATER FREQUENCY
SUBSURFACE SOIL ⁽¹⁾

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Organic Compounds			
2-Butanone	3.7	22	
2-Chlorophenol	0.055	8	
Acetone	5.1	88	
Benzo(a)pyrene	0.13	8	
Benzo(b)fluoranthene	0.17	12	
Benzoic acid	0.26	19	
Bis(2-ethylhexyl)phthalate	0.39	34	
Fluoranthene	0.45	27	
Methylene chloride	3.75	86	
Phenanthrene	0.17	12	
Pyrene	0.19	23	
Toluene	1.1	90	
Metals			
Aluminum	24100	100	No
Antimony	21.65	7	No
Arsenic	10.9	99	No
Barium	2970	100	Yes
Beryllium	2.1	86	No
Cadmium	1.8	7	No
Cesium	33.7	71	No
Chromium	217	98	Yes
Cobalt	21.4	95	No
Copper	52.1	100	No
Lead	84.9	100	Yes
Lithium	29.8	89	No
Manganese	907	100	No
Mercury	0.93	28	No
Nickel	41.5	64	No
Selenium	1.3	8	No
Strontium	506	100	Yes
Thallium	0.69	34	No
Vanadium	118	100	Yes
Zinc	706	100	Yes

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 4-2
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND METALS DETECTED AT
LESS THAN 5% FREQUENCY
SUBSURFACE SOIL ⁽¹⁾

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Organic Compounds			
1,4-Dichlorobenzene	0 064	4	
4-Methyl-2-pentanone	0 004	1	
Acenaphthene	0 056	4	
Benzene	0 006	1	
Benzo(a)anthracene	0 099	4	
Benzo(k)fluoranthene	0 06	4	
Chlorobenzene	0 074	0 3	
Chloroform	0 002	0 3	
Chrysene	0 12	4	
Diethyl phthalate	0 3	4	
Di-n-octyl phthalate	0 072	4	
Indeno(1,2,3-cd)pyrene	0 099	4	
Pentachlorophenol	0 66	4	
Phenol	0 055	4	
Styrene	0 001	0 3	
Xylenes, total	0 002	0 3	
Trichloroethene	0 021	2	
Metals			
Molybdenum	27 9	2	No
Silver	2 7	0 4	No
Tin	57 8	3	No

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 4-3
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SUBSURFACE SOIL⁽¹⁾
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD		Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Barium	2970	1 4E-04	*	7 0E-02	4 2E+04	9 2E-01	92 2
Zinc	706	n/a		3 0E-01	2 4E+03	5 1E-02	5 1
Strontium	506	n/a		6 0E-01	8 4E+02	1 8E-02	1 8
Chromium	217	n/a		1 0E+00	2 2E+02	4 7E-03	0 5
Acetone	5 1	n/a		1 0E-01	5 1E+01	1 1E-03	0 1
Methylene chloride	3 75	9 0E-01	*	6 0E-02	6 3E+01	1 4E-03	0 1
Bis(2-ethylhexyl)phthalate	0 39	n/a		2 0E-02	2 0E+01	4 2E-04	0 0
Pyrene	0 19	n/a		3 0E-02	6 3E+00	1 4E-04	0 0
Fluoranthene	0 45	n/a		4 0E-02	1 1E+01	2 4E-04	0 0
2-Chlorophenol	0 055	n/a		5 0E-03	1 1E+01	2 4E-04	0 0
Toluene	1 1	1 1E-01	*	2 0E-01	5 5E+00	1 2E-04	0 0
2-Butanone	3 7	3 0E-01	*	6 0E-01	6 2E+00	1 3E-04	0 0
Benzoic acid	0 26	n/a		4 0E+00	6 5E-02	1 4E-06	0 0
Total Risk Factor					4 6E+04		

RfDs are in units of mg/kg-day

n/a = not available

* Inhalation pathway is considered relatively minor in outdoors compared to direct ingestion Oral toxicity factors were used to calculate the risk factor

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 4-4
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SUBSURFACE SOIL⁽¹⁾
CARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Benzo(a)pyrene	0.13	n/a	7.3E+00	9.5E-01	8.6E-01	85.8
Benzo(b)fluoranthene	0.17	n/a	7.3E-01	1.2E-01	1.1E-01	11.2
Methylene chloride	3.75	1.6E-03 *	7.5E-03	2.8E-02	2.5E-02	2.5
Bis(2-ethylhexyl)phthalate)	0.39	n/a	1.4E-02	5.5E-03	4.9E-03	0.5
Total Risk Factor				1.1E+00		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

* Inhalation pathway is considered relatively minor in outdoors compared to direct ingestion. Oral toxicity factors were used to calculate the risk factor.

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 4-5
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
SUBSURFACE SOIL⁽¹⁾
RADIONUCLIDES

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD		Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Plutonium-239,240	0.88	3.8E-08	*	2.3E-10	2.0E-10	6.5E-01	65.2
Americium-241	0.44	3.2E-08	*	2.4E-10	1.1E-10	3.4E-01	34.0
Uranium-235	0.16	2.5E-08	*	1.6E-11	2.6E-12	8.2E-03	0.8
Total Risk Factor					3.1E-10		

Slope factors are in units of 1/pCi

n/a = not available

* Inhalation pathway is considered relatively minor in outdoors compared to direct ingestion. Oral toxicity factors were used to calculate the risk factor.

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE 4-6
ROCKY FLATS PLANT OU-6
DETECTED ORGANIC COMPOUNDS AND METALS ABOVE
BACKGROUND WITHOUT EPA TOXICITY FACTORS
SUBSURFACE SOIL

Lead
Phenanthrene

TABLE 4-7
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONCERN
SUBSURFACE SOIL¹

OU-Wide	
	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Methylene chloride
	Barium
	Strontium
	Zinc
	Americium-241
	Plutonium-239/240
	Uranium-235

¹ Excluding Old Outfall (IHSS 143)

GROUNDWATER CHEMICALS OF CONCERN

5.1 GROUNDWATER DATA SET

Monitoring wells in OU-6 were installed in the Upper Hydrostratigraphic Unit (UHSU). Chemicals of concern in groundwater were selected using data collected from first quarter 1991 through fourth quarter 1993. Groundwater samples were analyzed for metals, radionuclides, volatile organic compounds, semivolatile organic compounds, and pesticides/PCBs. The sampling and analytical programs for wells at each IHSS are summarized in Tables 2-3 and 2-4.

5.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Tables 5-1 and 5-2 summarize the maximum detected concentrations, detection frequencies, and results of background comparison for analytes detected in groundwater. The background comparison and maximum concentrations shown for metals and radionuclides are based on unfiltered sample results. Background data for UHSU groundwater were taken from the Background Geochemical Characterization Report (DOE 1993).

The statistical background comparisons for inorganics are presented in detail in Appendix A. Inspection of Table 5-1 and the appendix tables for unfiltered and filtered metals in groundwater reveal that nearly all metals, including typical rock-forming elements such as aluminum, calcium, iron, and sodium, were identified as being above background levels. Metals as potential chemicals of concern are discussed further in Section 5.3.

Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 5-5.

Several chlorinated solvents and other organic contaminants were detected in some wells in low concentrations (maximum concentrations ranged from 0.1 to 150 $\mu\text{g/L}$, and vinyl chloride at 860 $\mu\text{g/L}$) and at low detection frequencies (0.4 to 21 percent).

5.3 ELIMINATION OF METALS AS CONTAMINANTS OF CONCERN IN GROUNDWATER

As shown in Table 5-1 and Appendix A, nearly all metals analyzed for in groundwater were identified as being above background levels, including aluminum, calcium, iron, potassium, and sodium, which are common rock-forming minerals and not likely to be environmental contaminants in OU-6. All but four metals failed the formal statistical comparison, and most of those had anywhere from 17 to 42 results above the background UTL_{99/99}.

Because it is unusual, even at hazardous waste sites, to see so many metals above background levels, an evaluation was conducted to ascertain whether the elevated metals concentrations in OU-6 groundwater samples were due to factors other than environmental contamination. The evaluation consisted of (1) examining the spatial and temporal distribution of selected metals and (2) examining the relationship of elevated metals concentrations as a whole with organic contamination and with total suspended and total dissolved solids.

The conclusion of the evaluation was that the elevated metals concentrations are not related to environmental contamination but rather to local geochemical conditions and to suspended solids in the groundwater samples. Therefore, metals should not be considered chemicals of concern in groundwater in OU-6. Evidence supporting this conclusion is presented below.

- Presence of naturally occurring zones of high manganese and other ions. The results of the background comparison suggest that local geochemical conditions in OU-6 are different than those at the background sampling locations. The observances of elevated manganese and of elevated concentrations of iron, cobalt, lead, zinc, copper, nickel, and barium, which can associate with manganese oxides (Hem 1989), suggest the presence of naturally occurring mineralization in OU-6 that is absent in the background sampling locations. Elevated metals concentrations occur in both filtered and unfiltered samples. Investigations at the Rocky Flats Plant indicate a spotty distribution of high dissolved manganese in UHSU groundwater, and none of the background wells were located in zones of elevated manganese (Siders 1994). Therefore, it is probable that the background comparison gives

misleading results and that the elevated metals in OU-6 groundwater are due to local geochemical conditions

- Wide distribution of elevated metals and absence of spatial pattern Elevated concentrations of unfiltered and filtered metals were observed in samples widely distributed across the OU, with no relation to contaminant sources. Concentrations of unfiltered metals in wells in several areas of OU-6 are shown in Figures 5-1 through 5-4. For example, at wells 41691 and 0486 at Indiana Street (Figure 5-4), 19 metals--aluminum, antimony, barium, beryllium, cadmium, cobalt, chromium, copper, iron, lead, mercury, magnesium, manganese, nickel, potassium, silver, strontium, vanadium, and zinc--exceeded background levels (unfiltered results). In the nearest upgradient wells (3886, 41091, and 1186 in the South and North Walnut Creek drainages) (Figure 5-2), very few metals in unfiltered samples exceeded background levels (calcium, magnesium, sodium, and strontium in well 3886, barium, potassium, and manganese in well 41091, and chromium and magnesium in well 1186). There are numerous other examples of erratic spatial occurrence of samples having 10 or more metals with elevated concentrations. The absence of a meaningful spatial pattern indicates that the occurrences of elevated metals concentrations are not related to contaminant sources or plumes.
- No correlation of elevated metals with VOC contamination Elevated metals concentrations in groundwater can result from the solubilizing effects of organic contamination. However, this does not appear to be true in OU-6. Low concentrations of chlorinated solvents and other VOCs such as xylenes and toluene were detected at some sampling locations. Concentrations of VOCs in wells in several areas of OU-6 are shown in Figures 5-5 through 5-8. Elevated metals concentrations were observed in some samples from some of these wells but not in others. Elevated metals concentrations were also observed in many wells with no VOC contamination. Therefore, it is concluded that the metals concentrations are unrelated to organic contamination.

- Absence of temporal pattern The temporal occurrence of concentrations above background UTL_{99/99} was evaluated for selected metals. For example, concentrations of total antimony exceeded background UTL in 10 OU-6 wells at which multiple (4 to 13) sampling rounds were conducted (Figure 5-9). However, in 7 of the wells, the UTL was exceeded in only one sampling event, in 2 wells the UTL was exceeded in two sampling events, and in 1 well the UTL was exceeded in three sampling events out of ten. This pattern--i.e., temporally isolated occurrences of concentrations in excess of background UTL--was found to be true for many analytes. The temporal isolation of elevated concentrations of metals at a single sampling locations is inconsistent with an assumption of contamination.
- Strong correlation of elevated metals with Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) Elevated metals concentrations, and the number of elevated metals in a sample, strongly correlate with high TSS and TDS in the samples. TSS and TDS concentrations by well number are listed in Appendix C. TSS concentrations in many samples ranged as high as 1100 to 21,000 mg/L. TDS concentrations ranged as high as 1000 to 7600 mg/L. These samples had the highest metals concentrations as well. High TSS and TDS appear to be the largest factor contributing to elevated metals concentrations in groundwater samples. High TSS is not a sign of contamination but rather of sample turbidity resulting from well development and sampling procedures. As an example, samples from well 7287, which is located at Trench A (IHSS 166 1), contained numerous elevated metals in several sampling rounds and had TSS ranging as high as 17,000 mg/L (average = 3880 mg/L). Field notes indicate all samples were cloudy, muddy, or colored. On the other hand, samples from well B206489, which is adjacent to well 7287 (see Figure 5-1), had TSS ranging from 9 to 81 mg/L, and had only a single occurrence of a metal result exceeding background UTL. Field notes indicate all but one sample were clear.

Scatterplots comparing aluminum, arsenic, and barium concentrations with TSS and TDS revealed a strong correlation (data not shown)

It is concluded that elevated metals concentrations in OU-6 groundwater samples are related to suspended solids in the sample and to naturally occurring geochemical characteristics such as high manganese zones. Metals are therefore eliminated from further consideration as contaminants of concern in groundwater in OU-6.

5.4 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for organic contaminants and radionuclides are presented in Tables 5-3 through 5-5. Organic analytes detected at a frequency of 5 percent or greater and radionuclides above background levels were included in the screens.

All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern in groundwater for quantitative risk assessment. Chemicals of concern are listed below and in Table 5-7.

OU-Wide Chemicals of Concern Groundwater

Chloroform
Methylene chloride
Tetrachloroethene
Trichloroethene
Bis(2-ethylhexyl)phthalate
Nitrate

Plutonium-239,240
Americium-241
Radium-226
Cesium-137
Strontium-89,90

5.5 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Maximum concentration of 13 VOCs (detected at <5 percent frequency) and cesium-137 (as explained in Section 5.2) were compared to values equivalent to 1000 times the chemical-specific PRGs. The PRGs were calculated assuming residential use of groundwater and are used to identify special case chemicals of concern that could pose a health risk if exposure were to occur to maximum concentrations in a highly localized area. The screen is discussed in Appendix B and the results for groundwater are presented in Table B-3.

Vinyl chloride was the only chemical detected at low frequency that exceeded the 1000 times PRG value. Vinyl chloride will be retained for further evaluation as a special case chemical of concern in groundwater.

TABLE 5-1
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND TOTAL METALS DETECTED AT
5% OR GREATER FREQUENCY
UHSU GROUNDWATER

Chemical	Maximum Detected Concentration (mg/L)	Detection Frequency %	> Background?
Organic Compounds			
1,1,1-Trichloroethane	0 012	9	
1,1-Dichloroethane	0 062	9	
1,2-Dichloroethene	0 074	11	
1,2-Dichloroethene cis	0 0007	6	
Acetone	0 027	5	
Bis(2-ethylhexyl)phthalate	0 008	21	
Chloroform	0 008	9	
Diethyl phthalate	0 002	7	
Methylene chloride	0 032	12	
Tetrachloroethene	0 013	15	
Toluene	0 016	6	
Trichloroethene	0 15	14	
Metals			
Aluminum	456	95	Yes
Antimony	0 194	16	Yes
Arsenic	0 018	52	Yes
Barium	5 06	98	Yes
Beryllium	0 032	30	Yes
Cadmium	0 0329	26	Yes
Chromium	0 58	75	Yes
Cobalt	0 228	45	Yes
Copper	6 43	54	Yes
Lead	0 254	73	Yes
Lithium	0 456	93	Yes
Manganese	6 2	94	Yes
Mercury	0 0015	10	Yes
Molybdenum	0 0295	27	No
Nickel	1 07	66	Yes
Selenium	0 475	58	Yes
Silver	3 04	20	Yes
Strontium	6 96	100	Yes
Thallium	0 0027	5	No
Tin	0 267	19	No
Vanadium	0 754	74	Yes
Zinc	8	83	Yes

TABLE 5-2
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND TOTAL METALS DETECTED AT
LESS THAN 5% FREQUENCY
UHSU GROUNDWATER

Chemical	Maximum Detected Concentration (mg/L)	Detection Frequency %	> Background?
Organic Compounds			
1,1-Dichloroethene	0 005	1	
1,2-Dichloroethane	0 002	1	
1,2-Dichloroethene, trans	0 009	2	
1,2,4-Trimethylbenzene	0 0002	3	
2-Butanone	0 001	1	
2-Hexanone	0 005	0 4	
4-Methyl-2-pentanone	0 002	1	
Benzene	0 003	3	
Carbon disulfide	0 004	1	
Carbon tetrachloride	0 008	4	
Chloromethane	0 00025	0 4	
Ethylbenzene	0 001	2	
Styrene	0 00011	0 4	
Vinyl chloride	0 86	3	
Xylenes (total)	0 014	4	
Metals			
Cesium	0 15	2	No

TABLE 5-3
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
UHSU GROUNDWATER
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/L)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Nitrate	1760	n/a	1 6E+00	1 1E+03	9 9E-01	98 9
1,2-Dichloroethene	0 074	n/a	9 0E-03	8 2E+00	7 4E-03	0 7
Tetrachloroethene	0 013	n/a	1 0E-02	1 3E+00	1 2E-03	0 1
Chloroform	0 008	n/a	1 0E-02	8 0E-01	7 2E-04	0 1
1,1-Dichloroethane	0 062	1 4E-01	1 0E-01	6 2E-01	5 6E-04	0 1
Methylene chloride	0 032	9 0E-01	6 0E-02	5 3E-01	4 8E-04	0 0
Bis(2-ethylhexyl)phthalate	0 008	n/a	2 0E-02	4 0E-01	3 6E-04	0 0
Acetone	0 027	n/a	1 0E-01	2 7E-01	2 4E-04	0 0
Toluene	0 016	1 1E-01	2 0E-01	1 5E-01	1 3E-04	0 0
cis-1,2-Dichloroethene	0 0007	n/a	1 0E-02	7 0E-02	6 3E-05	0 0
Diethyl phthalate	0 002	n/a	8 0E-01	2 5E-03	2 2E-06	0 0
Total Risk Factor				1 1E+03		

RfDs are in units of mg/kg-day

n/a = not available

TABLE 5-4
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
UHSU GROUNDWATER
CARCINOGENS

Chemical	Maximum	Inhalation Slope Factor	Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
	Detected Conc (mg/L)					
Trichloroethene	0.15	6.0E-03	1.1E-02	1.7E-03	5.0E-01	49.7
Tetrachloroethene	0.013	2.0E-03	5.2E-02	6.8E-04	2.0E-01	20.4
Chloroform	0.008	8.0E-02	6.1E-03	6.4E-04	1.9E-01	19.3
Methylene chloride	0.032	1.6E-03	7.5E-03	2.4E-04	7.2E-02	7.2
Bis(2-ethylhexyl)phthalate	0.008	n/a	1.4E-02	1.1E-04	3.4E-02	3.4
Total Risk Factor				3.3E-03		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

TABLE 5-5
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
UHSU GROUNDWATER
RADIONUCLIDES

Chemical	Maximum Activity (pCi/L)	Inhalation Slope Factor		Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Radium-226	8.8	3.0E-09	*	1.2E-10	1.1E-09	3.7E-01	37.3
Plutonium-239,240	3.65	3.8E-08	*	2.3E-10	8.4E-10	3.0E-01	29.6
Americium-241	3.2	3.2E-08	*	2.4E-10	7.7E-10	2.7E-01	27.1
Cesium-137	4.499	1.9E-11	*	2.8E-11	1.3E-10	4.4E-02	4.4
Strontium-89,90	1.22	6.2E-11	*	3.6E-11	4.4E-11	1.6E-02	1.6
Total Risk Factor					2.8E-09		

Slope factors are in units of 1/pCi

* Inhalation of metals from groundwater is an incomplete pathway. Therefore oral toxicity factors were used in the screen.

TABLE 5-6
ROCKY FLATS PLANT OU-6
DETECTED ORGANIC COMPOUNDS
WITHOUT EPA TOXICITY FACTORS
UHSU GROUNDWATER

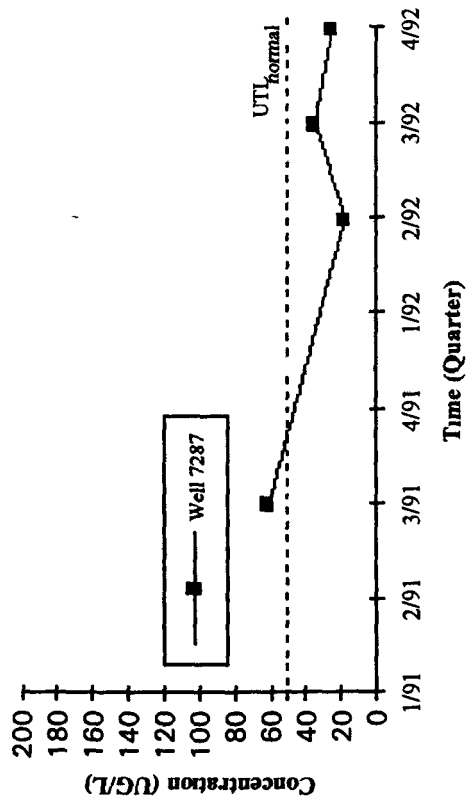
2-Hexanone
1,1,1-Trichloroethane

TABLE 5-7
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONCERN
UHSU GROUNDWATER

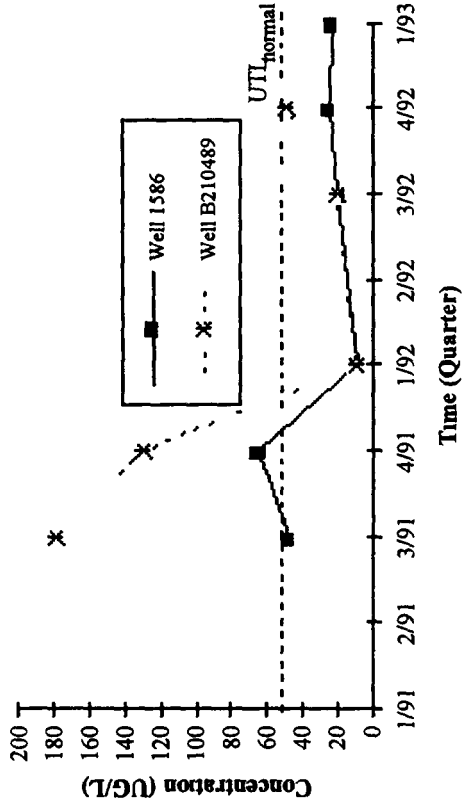
OU-Wide	Special Case ¹
Chloroform	Vinyl chloride
Methylene chloride	
Tetrachloroethene	
Trichloroethene	
Bis(2-ethylhexyl)phthalate	
Nitrate	
Plutonium-239,240	
Americium-241	
Radium-226	
Cesium-137	
Strontium-89,90	

¹ See Appendix B

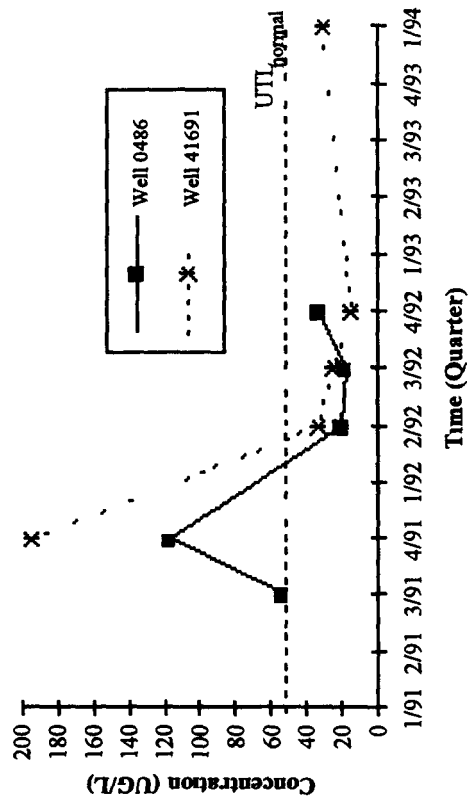
Pond Spray Field Area



Up gradient of North Walnut Creek

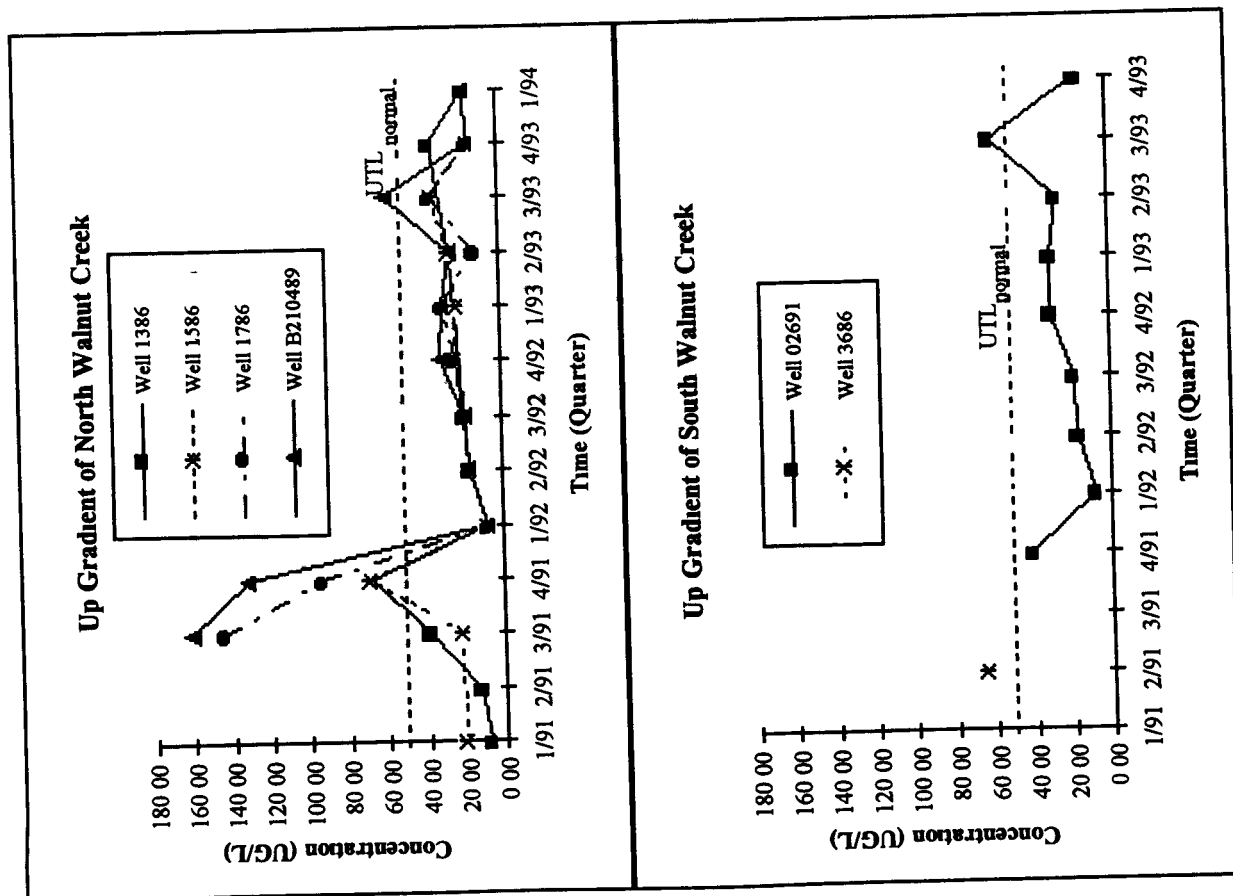


W & I Pond Area



UNFILTERED ANTIMONY
CONCENTRATIONS WITH TIME

FIGURE 5-9A



UNFILTERED ANTIMONY
CONCENTRATIONS WITH TIME

FIGURE 5-9B

POND SEDIMENT CHEMICALS OF CONCERN

6.1 POND SEDIMENT DATA SET

Wet sediment samples were collected in the A and B series ponds in the Walnut Creek drainage, including the terminal pond at Walnut Creek and Indiana Street. Collectively the ponds are IHSS 142. The A series ponds along North Walnut Creek are numbered IHSS 142 1 through 142 4. The B series ponds along South Walnut Creek are numbered IHSS 142 5 through 142 9. The terminal pond is IHSS 142 12. Pond locations are shown in Figure 1-1. Approximately 50 samples were collected and analyzed for metals, radionuclides, volatile and semivolatile organic compounds, and pesticides/PCBs. The sampling and analytical program for pond wet sediments (IHSS 142) is summarized in Tables 2-3 and 2-4.

6.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Tables 6-1 and 6-2 summarize the maximum detected concentrations, detection frequencies, and results of background comparison in the pond sediment samples. Background data from seeps/springs reported in the Background Geochemical Characterization Report (DOE 1993) were used for comparison to pond sediment data. Seep/spring background data were preferred to background stream sediment data for this comparison because of the similarity in flow regime (long residence time) between the seeps and ponds. The statistical comparisons of inorganic results to background data are presented in detail in Appendix A.

Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 6-5.

Analytes above background levels that were detected at 5 percent or greater detection frequency were included in concentration/toxicity screens to select OU-wide chemicals of concern, with the following exceptions:

Analytes Excluded as OU-Wide Potential Chemicals of Concern

Analyte	Statistically > Background ⁽¹⁾	Background UTL _{99/99}	No Results > UTL _{99/99}	Maximum Concentration
Antimony	No	55 mg/kg	1/28	68.5 mg/kg

⁽¹⁾ See Appendix A

One sample result exceeded the background UTL_{99/99}, however, antimony was not significantly different than background according to the statistical tests described in Appendix A. Therefore, antimony was removed as a potential OU-wide chemical of concern in pond sediment but was included in the risk-based PRG screen to identify special case chemicals of concern (Appendix B).

6.3 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for pond sediments are presented in Tables 6-3 through 6-5. All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern for quantitative risk assessment. Benzo(a)anthracene is also retained because it contributes 0.9 percent of the total risk factor.

Chemicals of concern are listed below and in Table 6-7.

OU-Wide Chemicals of Concern Pond Sediments

Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(a)anthracene
Bis(2-ethylhexyl)phthalate
Aroclor-1254
Manganese
Silver
Vanadium
Zinc
Plutonium-239,240
Americium-241

Chemicals of potential concern that do not have EPA-established toxicity factors are listed in Table 4-6. In pond sediments, these are 2-methylnaphthalene, benzo(ghi)perylene, phenanthrene, dibenzofuran, and copper. These compounds cannot be evaluated in a toxicity- or risk-based screen to select chemicals of concern. However, their potential contribution to overall risk will be evaluated qualitatively in the risk assessment for OU-6.

6.4 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Maximum concentrations of 10 VOCs, SVOCs, and pesticides/PCBs (detected at <5 percent frequency) and antimony (as explained in Section 6.2) were compared to values equivalent to 1000 times the chemical-specific PRGs. Although these chemicals were detected in pond sediment where exposure potential is limited, the PRGs used in this screening evaluation were calculated assuming long-term residential exposure. This approach is extremely conservative, since it assumes a daily exposure to chemicals in pond sediment including inhalation of particulate matter. The PRGs are used to identify special case chemicals of concern that could pose a health risk if exposure were to occur in a highly localized area. The screen is discussed in Appendix B and the results for pond sediment are presented in Table B-4.

None of the chemicals detected at low frequency in pond sediments exceeded the 1000 times PRG value. Therefore, no special case chemicals of concern were identified in pond sediments.

TABLE 6-1
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND METALS DETECTED AT
5% OR GREATER FREQUENCY
POND SEDIMENT

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Organic Compounds			
2-Butanone	0.13	53	
Acenaphthene	0.59	9	
Acetone	3.3	94	
Anthracene	0.8	20	
Aroclor-1254	10	44	
Benzene	0.01	6	
Benzo(a)anthracene	1.1	38	
Benzo(a)pyrene	0.87	41	
Benzo(b)fluoranthene	3.1	45	
Benzo(g,h,i)perylene	0.66	11	
Benzo(k)fluoranthene	1	32	
Benzoic acid	4.6	27	
Bis(2-ethylhexyl)phthalate	88	91	
Butyl benzylphthalate	0.12	5	
Chrysene	1.9	52	
Di-n-octyl phthalate	0.25	11	
Fluoranthene	3.5	66	
Indeno(1,2,3-cd)pyrene	0.66	14	
Methylene chloride	8.3	92	
Phenanthrene	2.6	54	
Pyrene	3.8	66	
Toluene	1.1	90	
Metals			
Aluminum	27400	100	No
Antimony	68.5	39	Yes
Arsenic	10.2	100	No
Barium	254	100	No
Beryllium	15.2	98	No
Cadmium	9.9	39	No
Cesium	5.8	93	No
Chromium	96.1	100	Yes
Cobalt	15.5	100	Yes
Copper	125	100	Yes
Lead	155	100	No
Lithium	16.6	98	No

TABLE 6-1
(continued)

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Manganese	558	100	Yes
Mercury	1 5	43	No
Nickel	58 1	70	No
Selenium	1 9	5	No
Silver	345	39	Yes
Strontium	307	100	No
Thallium	0 85	39	No
Vanadium	62 7	100	Yes
Zinc	1270	100	Yes

TABLE 6-2
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND METALS DETECTED AT
LESS THAN 5% FREQUENCY
POND SEDIMENT

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Organic Compounds			
1,2,4-Trichlorobenzene	0.13	2	
2-Methylnaphthalene	0.17	2	
4-Methyl-2-pentanone	0.006	2	
Aldrin	0.054	2	
Aroclor-1260	0.86	4	
Dibenzo(a,h)anthracene	0.15	2	
Dibenzofuran	0.18	2	
Fluorene	0.46	4	
gamma-BHC (Lindane)	0.025	2	
Heptachlor	0.039	1	
Naphthalene	0.39	2	
Phenol	0.29	4	
Metals			
Tin	39.5	2	No

TABLE 6-3
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
POND SEDIMENT
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Silver	345	n/a	5 0E-03	6 9E+04	7 6E-01	75 7
Vanadium	62 7	n/a	7 0E-03	9 0E+03	9 8E-02	9 8
Bis(2-ethylhexyl)phthalate	88	n/a	2 0E-02	4 4E+03	4 8E-02	4 8
Zinc	1270	n/a	3 0E-01	4 2E+03	4 6E-02	4 6
Manganese	558	1 4E-05	* 1 4E-01	4 0E+03	4 4E-02	4 4
Methylene chloride	8 3	9 0E-01	* 6 0E-02	1 4E+02	1 5E-03	0 2
Pyrene	3 8	n/a	3 0E-02	1 3E+02	1 4E-03	0 1
Chromium	96 1	n/a	1 0E+00	9 6E+01	1 1E-03	0 1
Fluoranthene	3 5	n/a	4 0E-02	8 8E+01	9 6E-04	0 1
Cobalt	15 5	n/a	1 8E-01	8 6E+01	9 4E-04	0 1
Acetone	3 3	n/a	1 0E-01	3 3E+01	3 6E-04	0 0
D1-n-octylphthalate	0 25	n/a	2 0E-02	1 3E+01	1 4E-04	0 0
Acenaphthene	0 59	n/a	6 0E-02	9 8E+00	1 1E-04	0 0
Toluene	1 1	1 1E-01	* 2 0E-01	5 5E+00	6 0E-05	0 0
Anthracene	0 8	n/a	3 0E-01	2 7E+00	2 9E-05	0 0
Benzoic acid	4 6	n/a	4 0E+00	1 2E+00	1 3E-05	0 0
Butyl benzylphthalate	0 12	n/a	2 0E-01	6 0E-01	6 6E-06	0 0
2-Butanone	0 13	3 0E-01	* 6 0E-01	2 2E-01	2 4E-06	0 0
Total Risk Factor				9 1E+04		

RfDs are in units of mg/kg-day

n/a = not available

* Inhalation is an incomplete pathway because pond sediments are assumed to remain saturated and contaminants are not released to air. Therefore, oral toxicity factors were used in this screen.

TABLE 6-4
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
POND SEDIMENT
CARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation Slope Factor	Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Aroclor-1254	10	n/a	7.7E+00	7.7E+01	8.7E-01	87.1
Benzo(a)pyrene	0.87	n/a	7.3E+00	6.4E+00	7.2E-02	7.2
Benzo(b)fluoranthene	3.1	n/a	7.3E-01	2.3E+00	2.6E-02	2.6
Bis(2-ethylhexyl)phthalate	88	n/a	1.4E-02	1.2E+00	1.4E-02	1.4
Benzo(a)anthracene	1.1	n/a	7.3E-01	8.0E-01	9.1E-03	0.9
Indeno(1,2,3-cd)pyrene	0.66	n/a	7.3E-01	4.8E-01	5.4E-03	0.5
Chrysene	1.9	n/a	7.3E-02	1.4E-01	1.6E-03	0.2
Benzo(k)fluoranthene	1	n/a	7.3E-02	7.3E-02	8.3E-04	0.1
Methylene chloride	8.3	1.6E-03	*	7.5E-03	6.2E-02	7.0E-04
Benzene	0.01	2.9E-02	*	2.9E-02	2.9E-04	3.3E-06
Total Risk Factor				8.8E+01		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

* Inhalation is an incomplete pathway because pond sediments are assumed to remain saturated and contaminants are not released to air. Therefore, oral toxicity factors were used in this screen.

TABLE 6-5
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
POND SEDIMENT
RADIONUCLIDES

Chemical	Maximum Activity (pCi/g)	Inhalation Slope Factor		Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Plutonium-239 240	1174	3 8E-08	*	2 3E-10	2 7E-07	8 3E-01	82 6
Americium-241	230 53	3 2E-08	*	2 4E-10	5 5E-08	1 7E-01	16 9
Uranium-238	26 445	5 2E-08	*	2 8E-11	7 4E-10	2 3E-03	0 2
Uranium-233 234	15 935	2 6E-08	*	1 6E-11	2 5E-10	7 8E-04	0 1
Uranium-235	0 854	2 5E-08	*	1 6E-11	1 4E-11	4 2E-05	0 0
Radium-226	1 25	3 0E-09	*	1 2E-10	1 5E-10	4 6E-04	0 0
Radium-228	2 3	6 6E-10	*	1 0E-10	2 3E-10	7 0E-04	0 1
Strontium-89 90	1 8	6 2E-11	*	3 6E-11	6 5E-11	2 0E-04	0 0
Total Risk Factor					3 3E-07		

Slope factors are in units of 1/pCi

* Inhalation is an incomplete pathway because pond sediments are assumed to remain saturated and contaminants are not released to air. Therefore, oral toxicity factors were used in the screen.

TABLE 6-6
ROCKY FLATS PLANT OU-6
DETECTED ORGANIC COMPOUNDS AND METALS ABOVE
BACKGROUND WITHOUT EPA TOXICITY FACTORS
POND SEDIMENT

2-Methylnaphthalene
Benzo(g,h,i)perylene
Dibenzofuran
Phenanthrene
Copper

TABLE 6-7
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONERN
POND SEDIMENT

OU-Wide	
	Aroclor-1254
	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Bis(2-ethylhexyl)phthalate
	Manganese
	Silver
	Vanadium
	Zinc
	Americium-241
	Plutonium-239/240

POND SURFACE WATER CHEMICALS OF CONCERN

7.1 POND SURFACE WATER DATA SET

Approximately 50 surface water samples were collected in the A and B series ponds in the Walnut Creek drainage, including the terminal pond at Walnut Creek and Indiana Street. Samples were analyzed for metals, radionuclides, and volatile and semivolatile organic compounds. The sampling and analytical program for pond surface water (IHSS 142) is summarized in Tables 2-3 and 2-4.

7.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Tables 7-1 and 7-2 summarize the maximum detected concentrations, detection frequencies, and results of background comparison in the pond surface water samples. Background data from seeps/springs reported in the Background Geochemical Characterization Report (DOE 1993) were used for comparison to pond surface water data. Seep/spring background data were preferred to background stream data for this comparison because of the similarity in flow regime (long residence time) between the seeps and ponds. The statistical comparisons of inorganic results to background data are presented in detail in Appendix A.

Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 7-5.

Analytes above background levels that were detected at 5 percent or greater detection frequency were included in concentration/toxicity screens to select OU-wide chemicals of concern. Compounds detected at less than 5 percent frequency were evaluated in the risk-based PRG screen to identify special case chemicals of concern.

7.3 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for pond surface water are presented in Tables 7-3 through 7-5. All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern for quantitative risk assessment. All analytes detected at greater than 5 percent frequency are retained as chemicals of concern because they each contribute 0.8 to 77.5 percent of the total risk factors for noncarcinogenic, carcinogenic, and radiation risk factors.

Chemicals of concern are listed below and in Table 7-6.

OU-Wide Chemicals of Concern Pond Surface Water

Acetone
Chloroform
1,2-Dichloroethene
Methylene chloride
Trichloroethene
Di-n-butyl-phthalate
Uranium-233,234
Uranium-235
Uranium-238

7.4 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED COMPOUNDS

Tetrachloroethene and 1,2-dichloroethane (detected at <5 percent frequency) were detected in pond surface water and compared to values equivalent to 1000 times the chemical-specific PRGs. Although these chemicals were detected in pond surface water, the PRGs used in this screening evaluation were calculated assuming residential exposure to groundwater. This approach is extremely conservative, since it assumes daily ingestion of pond surface water as drinking water. The PRGs are used to identify special case chemicals of concern that could pose a health risk if exposure were to occur to maximum concentrations in a highly

localized area The screen is discussed in Appendix B and the results for pond surface water are presented in Table B-5

Neither of the chemicals detected at low frequency in pond surface water exceeded the 1000 times PRG value Therefore, no special case chemicals of concern were identified in pond surface water

TABLE 7-1
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND TOTAL METALS DETECTED AT
5% OR GREATER FREQUENCY
POND SURFACE WATER

Chemical	Maximum Detected Concentration (mg/L)	Detection Frequency %	> Background?
Organic Compounds			
1,2-Dichloroethene	0 003	8	
Acetone	0 14	29	
Chloroform	0 002	20	
Di-n-butylphthalate	0 002	12	
Methylene chloride	0 036	14	
Trichloroethene	0 006	12	
Metals			
Aluminum	1 02	98	No
Antimony	0 0205	6	No
Arsenic	0 0066	41	No
Barium	0 12	100	No
Cadmium	0 0022	22	No
Cesium	0 06	12	No
Chromium	0 0043	16	No
Cobalt	0 0036	35	No
Copper	0 0047	19	No
Lead	0 0158	78	No
Lithium	0 0545	100	No
Manganese	0 293	100	No
Mercury	0 00096	33	No
Molybdenum	0 0176	75	No
Nickel	0 0063	47	No
Selenium	0 0083	22	No
Silver	0 0027	6	No
Strontium	0 568	100	No
Tin	0 0119	20	No
Vanadium	0 0056	49	No
Zinc	0 0748	76	No

TABLE 7-2
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND TOTAL METALS DETECTED AT
LESS THAN 5% FREQUENCY
POND SURFACE WATER

Chemical	Maximum Detected Concentration (mg/L)	Detection Frequency %	> Background?
Organic Compounds			
1,2-Dichloroethane	0.001	2	
Tetrachloroethene	0.012	4	
Metals			
Beryllium	0.00034	4	No

TABLE 7-3
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
POND SURFACE WATER
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/L)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Acetone	0.14	n/a	1.0E-01	1.4E+00	5.5E-01	54.8
Methylene chloride	0.036	9.0E-01 *	6.0E-02	6.0E-01	2.3E-01	23.5
1,2-Dichloroethene	0.003	n/a	9.0E-03	3.3E-01	1.3E-01	13.1
Chloroform	0.002	n/a	1.0E-02	2.0E-01	7.8E-02	7.8
Di-n-butylphthalate	0.002	n/a	1.0E-01	2.0E-02	7.8E-03	0.8
Total Risk Factor				2.6E+00		

RfDs are in units of mg/kg-day

n/a = not available

* Inhalation of volatile organic compounds released to air in the outdoors is a negligible pathway. Therefore, oral toxicity factors were used in the screen.

**TABLE 7-4
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
POND SURFACE WATER
CARCINOGENS**

Chemical	Maximum Detected Conc (mg/L)	Inhalation Slope Factor		Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Methylene chloride	0.036	1.6E-03	*	7.5E-03	2.7E-04	7.8E-01	77.5
Trichloroethene	0.006	6.0E-03	*	1.1E-02	6.6E-05	1.9E-01	19.0
Chloroform	0.002	8.0E-02	*	6.1E-03	1.2E-05	3.5E-02	3.5
Total Risk Factor					3.5E-04		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

* Inhalation of volatile organic compounds released to air in the outdoors is a negligible pathway. Therefore, oral toxicity factors were used in the screen.

TABLE 7-5
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
POND SURFACE WATER
RADIONUCLIDES

Chemical	Maximum Activity (pCi/L)	Inhalation Slope Factor		Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Uranium-238	4 475	5 2E-08	*	2 8E-11	1 3E-10	6 5E-01	64 8
Uranium-233,234	3 688	2 6E-08	*	1 6E-11	5 9E-11	3 1E-01	30 5
Uranium-235	0 56	2 5E-08	*	1 6E-11	9 0E-12	4 6E-02	4 6
Total Risk Factor					1 9E-10		

Slope factors are in units of 1/pCi

* Radionuclides in surface water do not volatilize to air Therefore, oral toxicity factors were used in this screen

TABLE 7-6
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONCERN
POND SURFACE WATER

OU-Wide
1,2-Dichloroethene
Acetone
Chloroform
Methylene chloride
Trichloroethene
Uranium-233/234
Uranium-235
Uranium-238

STREAM SEDIMENT CHEMICALS OF CONCERN

8.1 STREAM SEDIMENT DATA SET

Fifteen stream sediment samples were collected in the North and South Walnut Creeks including locations upgradient of the A and B series ponds to help characterize potential contaminant transport through surface water/sediment pathways. Samples were analyzed for metals, radionuclides, volatile and semivolatile organic compounds, and pesticides/PCBs. The sampling and analytical program for stream sediments is summarized in Tables 2-3 and 2-4.

8.2 BACKGROUND COMPARISON AND FREQUENCY OF DETECTION

Table 8-1 summarizes the maximum detected concentrations, detection frequencies, and results of background comparison for analytes detected in the stream sediment samples. All analytes were detected at greater than 5 percent frequency. Background data from streambeds reported in the Background Geochemical Characterization Report (DOE 1993) were used for comparison. The statistical comparisons of inorganic results to background data are presented in detail in Appendix A.

Radionuclides are assumed to be detected at 100 percent frequency, and radionuclides above background levels are listed in the concentration/toxicity screen in Table 8-4.

Organic compounds and inorganic analytes above background levels were included in concentration/toxicity screens to select OU-wide chemicals of concern, with the exception of arsenic, manganese, and barium. These metals are considered to be naturally occurring, for the reasons explained in section 8.3.

8.3 EVALUATION OF ARSENIC, MANGANESE, AND BARIUM

8.3.1 Arsenic

The statistical background evaluation of arsenic in stream sediments concluded that because of failure of the Gehan test, arsenic in stream sediments was statistically different from background and should be retained as a potential chemical of concern. However, a more in-depth review of the data supports the conclusion that arsenic in stream sediments is naturally occurring and is not an environmental contaminant.

Summary statistics for arsenic in surface soil and stream sediment are shown in the table below, and the reasons for concluding arsenic is not a contaminant in stream sediment follow. Arsenic in surface soil did not exceed background levels (see Appendix A).

	Arsenic in Surface Soil, mg/kg		Arsenic in Stream Sediment, mg/kg	
	Background	OU-6	Background	OU-6
Mean	5.8	5.3	2.4	3.6
Std Dev	1.8	1.9	2.5	1.3
Maximum	8.5	11.0	17.3	5.8
N	18	119	59	15
Det Freq	100%	100%	49%	93%

- The OU-6 stream sediment maximum (5.8 mg/kg) is approximately three times lower than the background maximum (17.3 mg/kg). The two highest detected values (7.3 and 17.3 mg/kg) were in the background samples.
- The OU-6 stream sediment maximum of 5.8 mg/kg is well below the UTL_{99/99} of background (10 mg/kg) and below the background mean plus two standard deviations (7.4 mg/kg).

- Surface soil is the largest source of sediment in stream beds. Arsenic in OU-6 surface soil did not differ significantly from background. Since the maximum arsenic concentration in stream sediments is equivalent to the mean background concentration in surface soil, arsenic is not considered a contaminant in stream sediments in OU-6.

8.3.2 Manganese

The statistical background evaluation of manganese in stream sediments concluded that because of failure of the Gehan test, manganese in stream sediments was statistically different from background levels and should be retained as a potential chemical of concern. However, a more in-depth review of the data supports the conclusion that manganese in stream sediments is naturally occurring and is not an environmental contaminant.

Summary statistics for manganese in surface soil and stream sediment are shown in the table below, and the reasons for concluding manganese is not a contaminant in stream sediment follow. Manganese in surface soil did not exceed background levels (see Appendix A).

	Manganese in Surface Soil, mg/kg		Manganese in Stream Sediment, mg/kg	
	Background	OU-6	Background	OU6
Mean	443	265	217	366
Std Dev	457	114	225	240
Maximum	2220	823	1280	1000
N	18	119	59	15
Det Freq	100%	100%	80%	100%

- The OU-6 stream sediment maximum (1000 mg/kg) is lower than the background maximum (1280 mg/kg). The next highest OU-6 stream sediment concentration was 639 mg/kg, which is below the maximum values detected in background and OU-6 surface soils.

- Surface soil is the largest source of sediment in stream beds. Manganese in OU-6 surface soils was not found to exceed background levels. The mean manganese concentration in stream sediments (366 mg/kg) is below the mean background concentration in surface soil (443 mg/kg). Therefore, manganese is not considered a contaminant in stream sediments in OU-6 and is concluded to be the result of naturally occurring manganese in native geologic materials.

8.3.3 Barium

The statistical background evaluation of barium in stream sediments concluded that because of failure of the Gehan test, barium in OU-6 stream sediments was statistically different from background and should be retained as a potential chemical of concern. However, a more in-depth review of the data supports the conclusion that barium in stream sediments is naturally occurring and is not an environmental contaminant.

Summary statistics for barium in surface soil and stream sediment are shown in the table below, and the reasons for concluding barium is not a contaminant in stream sediment follow. Barium did not exceed background levels in surface soil.

	Barium in Surface Soil, mg/kg		Barium in Stream Sediment, mg/kg	
	Background	OU-6	Background	OU6
Mean	194	147	78	107
Std Dev	84	52	56	32
Maximum	470	272	244	177
N	18	119	57	15
Det Freq	100%	100%	100%	100%

- The OU-6 sediment maximum (177 mg/kg) is lower than the background maximum (244 mg/kg).

- The OU-6 sediment maximum of 177 mg/kg is below the background UTL_{99/99} of 251 mg/kg and below the background mean plus two standard deviations (190 mg/kg)
- Surface soil is the largest source of sediment in stream beds. Barium in OU-6 surface soils was not statistically different than background. Since the maximum barium concentration in stream sediments is comparable to the mean concentrations in surface soil, and barium in surface soil does not exceed background levels, barium is not considered a contaminant in stream sediments in OU-6.

Other metals included in the concentration/toxicity screens may also be naturally occurring but were not evaluated in detail.

8.4 CONCENTRATION/TOXICITY SCREENS

Concentration/toxicity screens for chemicals of concern in stream sediments are presented in Tables 8-2 through 8-4. All analytes that contribute at least 1 percent of the total risk factor are retained as OU-wide chemicals of concern for quantitative risk assessment. Chrysene is also retained as a chemical of concern since it contributed 0.8 percent of the total carcinogenic risk factor. The metal chemicals of concern in sediment were also identified as being above background levels in surface soil. Chemicals of concern are listed below and in Table 8-6.

Chemicals of potential concern that do not have EPA-established toxicity factors are listed in Table 8-5. In stream sediments, these are benzo(ghi)perylene, dibenzofuran, and phenanthrene. These compounds cannot be evaluated in a toxicity- or risk-based screen to select chemicals of concern. However, their potential contribution to overall risk will be evaluated qualitatively in the risk assessment for OU-6.

**OU-Wide Chemicals of Concern
Stream Sediments**

Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(a)anthracene
Indeno(123-cd)pyrene
Chrysene
Cobalt
Strontium
Vanadium
Zinc
Plutonium-239,240
Americium-241

**8.5 RISK-BASED EVALUATION OF INFREQUENTLY DETECTED
COMPOUNDS**

There were no compounds in stream sediments at less than 5 percent frequency, so a PRG screening evaluation was not performed

TABLE 8-1
ROCKY FLATS PLANT OU-6
ORGANIC COMPOUNDS AND METALS DETECTED AT
5% OR GREATER FREQUENCY⁽¹⁾
STREAM SEDIMENT

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Organic Compounds			
Acenaphthene	0.13	7	
Acetone	0.063	7	
Anthracene	0.15	20	
Benzo(a)anthracene	0.43	27	
Benzo(a)pyrene	0.48	33	
Benzo(b)fluoranthene	0.65	27	
Benzo(g,h,i)perylene	0.16	13	
Benzo(k)fluoranthene	0.23	20	
Benzoic acid	0.51	33	
Benzyl alcohol	0.041	7	
Bis(2-ethylhexyl)phthalate	0.19	27	
Butyl benzylphthalate	0.12	7	
Chrysene	0.51	33	
Di-n-butyl phthalate	0.075	33	
Dibenzofuran	0.037	7	
Fluoranthene	1	47	
Fluorene	0.089	7	
Indeno(1,2,3-cd)pyrene	0.18	20	
Methylene chloride	0.007	7	
Naphthalene	0.046	7	
Phenanthrene	0.75	33	
Pyrene	0.96	33	
Metals			
Aluminum	11600	100	No
Antimony	26.3	13	No
Arsenic	5.8	93	Yes
Barium	177	100	Yes
Beryllium	1	53	No
Cadmium	0.8	7	No
Cesium	18.1	47	No
Chromium	12.3	100	No
Cobalt	12.4	100	Yes
Copper	17.7	60	No
Lead	94.8	100	No
Lithium	15.2	93	No

**TABLE 8-1
(Concluded)**

Chemical	Maximum Detected Concentration (mg/kg)	Detection Frequency %	> Background?
Manganese	1000	100	Yes
Mercury	0.13	27	No
Nickel	19.2	47	No
Selenium	0.45	13	No
Silver	1.4	7	No
Strontium	95.8	100	Yes
Thallium	0.46	33	No
Vanadium	33.9	100	Yes
Zinc	178	100	Yes

⁽¹⁾ All detected analytes were detected at a frequency greater than 5 percent

TABLE 8-2
ROCKY FLATS PLANT OU-6
CONCENTRATION/TOXICITY SCREEN
STREAM SEDIMENT
NONCARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation RfD	Oral RfD	Risk Factor	Risk Index	% of Total Risk Factor
Vanadium	33.9	n/a	7.0E-03	4.8E+03	8.4E-01	84.4
Zinc	178	n/a	3.0E-01	5.9E+02	1.0E-01	10.3
Strontium	95.8	n/a	6.0E-01	1.6E+02	2.8E-02	2.8
Cobalt	12.4	n/a	1.8E-01	6.9E+01	1.2E-02	1.2
Pyrene	0.96	n/a	3.0E-02	3.2E+01	5.6E-03	0.6
Fluoranthene	1	n/a	4.0E-02	2.5E+01	4.4E-03	0.4
Bis(2-ethylhexyl)phthalate	0.19	n/a	2.0E-02	9.5E+00	1.7E-03	0.2
Fluorene	0.089	n/a	4.0E-02	2.2E+00	3.9E-04	0.0
Acenaphthene	0.13	n/a	6.0E-02	2.2E+00	3.8E-04	0.0
Naphthalene	0.046	n/a	4.0E-02	1.2E+00	2.0E-04	0.0
Di-n-butylphthalate	0.075	n/a	1.0E-01	7.5E-01	1.3E-04	0.0
Acetone	0.063	n/a	1.0E-01	6.3E-01	1.1E-04	0.0
Butyl benzylphthalate	0.12	n/a	2.0E-01	6.0E-01	1.0E-04	0.0
Anthracene	0.15	n/a	3.0E-01	5.0E-01	8.7E-05	0.0
Benzyl alcohol	0.041	n/a	3.0E-01	1.4E-01	2.4E-05	0.0
Benzoic acid	0.51	n/a	4.0E+00	1.3E-01	2.2E-05	0.0
Methylene chloride	0.007	9.0E-01 *	6.0E-02	1.2E-01	2.0E-05	0.0
Total Risk Factor				5.7E+03		

RfDs are in units of mg/kg-day

n/a = not available

* Inhalation of chemicals released to air from stream sediment is a relatively minor exposure route
Therefore, oral toxicity factors were used in the screen

TABLE 8-3
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
STREAM SEDIMENT
CARCINOGENS

Chemical	Maximum Detected Conc (mg/kg)	Inhalation Slope Factor	Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Benzo(a)pyrene	0.48	n/a	7.3E+00	3.5E+00	7.8E-01	78.2
Benzo(b)fluoranthene	0.65	n/a	7.3E-01	4.7E-01	1.1E-01	10.6
Benzo(a)anthracene	0.43	n/a	7.3E-01	3.1E-01	7.0E-02	7.0
Indeno(1,2,3-cd)pyrene	0.18	n/a	7.3E-01	1.3E-01	2.9E-02	2.9
Chrysene	0.51	n/a	7.3E-02	3.7E-02	8.3E-03	0.8
Benzo(k)fluoranthene	0.23	n/a	7.3E-02	1.7E-02	3.7E-03	0.4
Bis(2-ethylhexyl)phthalate	0.19	n/a	1.4E-02	2.7E-03	5.9E-04	0.1
Methylene chloride	0.007	1.6E-03	* 7.5E-03	5.3E-05	1.2E-05	0.0
Total Risk Factor				4.5E+00		

Slope factors are in units of 1/(mg/kg-day)

n/a = not available

* Inhalation of chemicals released to air from stream sediment is a negligible pathway. Therefore, oral toxicity factors were used in the screen.

TABLE 8-4
ROCKY FLATS OU-6
CONCENTRATION/TOXICITY SCREEN
STREAM SEDIMENT
RADIONUCLIDES

Chemical	Maximum Activity (pCi/g)	Inhalation Slope Factor		Oral Slope Factor	Risk Factor	Risk Index	% of Total Risk Factor
Plutonium-239,240	1.95	3.8E-08	*	2.3E-10	4.5E-10	7.1E-01	71.4
Americium-241	0.75	3.2E-08	*	2.4E-10	1.8E-10	2.9E-01	28.6
Total Risk Factor					6.3E-10		

Slope factors are in units of 1/pCi

* Inhalation of chemicals released to air from stream sediment is a negligible pathway. Therefore, oral toxicity factors were used in the screen.

TABLE 8-5
ROCKY FLATS PLANT OU-6
DETECTED ORGANIC COMPOUNDS AND METALS ABOVE
BACKGROUND WITHOUT EPA TOXICITY FACTORS
STREAM SEDIMENT

Benzo(g,h,i)perylene
Dibenzofuran
Phenanthrene

TABLE 8-6
ROCKY FLATS PLANT OU-6
CHEMICALS OF CONCERN
STREAM SEDIMENTS

OU-Wide	
	Benzo(a)anthracene
	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Chrysene
	Indeno(1,2,3-cd)pyrene
	Cobalt
	Strontium
	Vanadium
	Zinc
	Americium-241
	Plutonium-239/240

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APPENDIX A
BACKGROUND COMPARISON FOR METALS AND RADIONUCLIDES

APPENDIX A

BACKGROUND COMPARISON FOR METALS AND RADIONUCLIDES

Concentrations of metals and radionuclides measured in soil, groundwater, surface water, and sediment in OU-6 were compared to background concentrations in order to identify OU-6 analytes whose concentrations are statistically higher than background levels. These analytes are then identified as potential chemicals of concern for further evaluation. The background data used for comparison were reported in the Background Geochemical Characterization Report (DOE 1993), except for the surficial soil data, which were not available in the 1993 report. The background surficial soil data were collected in the Rock Creek area during the 1991 OU-1 Phase III investigation and the 1993 OU-2 Phase II investigation. Analytical results from each medium sampled were pooled, and the background comparison was performed on an OU-wide basis.

The procedures applied in the background comparisons are shown in the flow chart in Figure A-1. Three major steps were involved: (1) data aggregation, (2) statistical background comparisons, and (3) statistical professional judgement. Each of these steps is discussed below.

A.1 DATA AGGREGATION

The chemical data were grouped by medium into seven categories: (1) subsurface soil in the upper hydrostratigraphic unit (UHSU), (2) surficial soil, (3) pond sediment, (4) stream sediment, (5) groundwater (UHSU), (6) pond surface water, and (7) baseflow stream surface water. In general, each medium has 29 analytes for metals and 13 analytes for radionuclides, as unfiltered or filtered concentrations. There are a total of 20 media-analyte groups to be evaluated in the background comparisons, as shown in Table A-1.

Most of OU-6 media-analyte groups were compared directly to the corresponding background groups. Exceptions were pond sediment and pond surface water due to the lack of background pond data. Background data from seep/spring sampling locations (rather than from background stream locations) were adopted for comparison to OU-6 pond data because

of the similarity of the flow conditions for ponds and seeps/springs (both of them have relatively long residence time)

A.2 STATISTICAL BACKGROUND COMPARISON

Background comparisons were performed according to the procedures given in the "Guidance Document, Statistical Comparisons of Site-To-Background Data in Support of RFI/RI Investigations" (EG&G 1994), which was primarily based on the methodology proposed by Gilbert (Gilbert 1993). The formal statistical tests were the Gehan test, Slippage test, Quantile test, and t test. Analytical results were also compared to the upper tolerance limit ($UTL_{99/99}$) of background to identify high concentrations out of background range. The conditions for applying each of the tests are briefly discussed below.

A.2.1 Formal Statistical Tests

Four formal statistical tests were performed to test the difference between the background and site populations. If any of the four statistical tests was significant, the analyte was considered to be a potential chemical of concern. Significance was defined as a p value less than or equal to 0.05, the Type I (false positive) error rate. Non-detects of metals were treated as described below for each test. All the radionuclide results were treated as detects.

1 Gehan Test

The Gehan test (Gehan 1965, explained in Gilbert 1993) is a non-parametric ranking test. It was performed for all the media-analyte groups. For non-detects, the reporting limits were used for ranking purposes.

2 Slippage Test

The slippage test (Rosenbaum 1954), a non-parametric test, was performed by comparing the OU-6 measurements to the maximum background measurement (detect or non-detect). The p value for the probability of the number of site measurements greater than the maximum background measurement was calculated. Reporting limits were used for non-detects.

3 Quantile Test

The Quantile test (Gilbert and Simpson 1992), a non-parametric test, was performed by first ranking the combined background and OU-6 measurements from largest to smallest. If there were no non-detects among the top 20% of the combined background and OU-6 measurements, the probability of the number of site measurements within the top 20% of the data set was calculated. If there were any non-detects among the top 20% of the measurements, no Quantile test was performed.

4 t Test

The t test, a parametric statistical test, was performed under these conditions that (1) the non-detects in each of the data sets is less than 20% of the measurements, and (2) EITHER each of the data sets contains at least 20 data points, OR both of the data sets are normally distributed.

For simplicity, the t test was only performed when condition (1) and the first option of condition (2) were met. Non-detect results for metals were replaced by one-half the reporting limits.

The homogeneity of the variance was tested following Levene's test (EPA 1992). If the variances from both data sets were the same, the standard t test was performed. If the variances were not the same, the unequal variance t test (Helsel and Hirsch 1992) was performed.

A.2.2 Upper Tolerance Limit (UTL_{99/99}) Comparison

For each media-analyte in the background data, an upper tolerance limit with 99% confidence and 99% coverage (UTL_{99/99}) was calculated, assuming the background data were normally distributed (EG&G 1994). In calculating the UTL, if non-detects were less than 80% of the data, one-half the reporting limit was used as the result for non-detect samples. Otherwise, the maximum background measurement, instead of the UTL_{99/99}, was used in the comparisons. For the radionuclides, all the results were treated as detects (EG&G 1994).

Each of the OU-6 measurements was compared to the $UTL_{99/99}$. If one or more OU-6 measurements exceed the background $UTL_{99/99}$, the analyte was considered as a potential chemical of concern for further evaluation, even if the analyte did not exceed background levels according to the formal statistical evaluation.

A.3 BACKGROUND COMPARISON RESULTS

The number of inorganic potential chemicals of concern in each media-analyte group resulting from the background comparisons is summarized in Table A-1. Out of 374 media-analytes, 142 media-analytes were identified as above background based on the formal statistical tests. An additional 32 media-analytes were identified as above background based on the $UTL_{99/99}$ comparison alone.

The summary tables for the background comparisons for each media-analyte group are presented in the remaining tables in Appendix A.

A.4 STATISTICAL PROFESSIONAL JUDGEMENT

Statistical professional judgement was applied for those media-analytes that were below background according to the formal statistical tests but failed to pass the $UTL_{99/99}$ comparisons. The professional judgement consisted of performing a log-normal $UTL_{99/99}$ comparison if the background data were log-normally distributed.

According to the background comparison methodology (EG&G 1994), the $UTL_{99/99}$ was calculated assuming a normal distribution of background data. However, log-normal distribution may better describe some geochemical data, as indicated in the Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities (EPA 1992). Log-normal-based $UTL_{99/99}$ s were calculated for media-analytes that passed the formal statistical tests but failed to pass the normal-based $UTL_{99/99}$ comparison. If a media-analyte passed the log-normal-based $UTL_{99/99}$ comparison, probability plots were generated for both normal and log-normal distributions. If the probability plots indicated that the data better fit a log-normal distribution, the media-analyte was eliminated from the potential chemical of concern list.

A positive constant was added to the radionuclide results (including negative and zero values) to make all the results positive prior to log transformation. The constant was selected to improve the goodness of fit of the appropriate distribution. After the log-normal $UTL_{99/99}$ was calculated based on this shifted distribution, the constant was subtracted from the calculated $UTL_{99/99}$ to get the "true" log-normal $UTL_{99/99}$ value.

The results of the log-normal-based $UTL_{99/99}$ comparisons are presented in the remark column in the summary tables. Based on the results of the log-normal $UTL_{99/99}$ comparison, the following ten analytes were eliminated as potential chemicals of concern:

Medium	Analyte
Surface Soil	Aluminum Cadmium Uranium-233,234
Subsurface Soil	Copper
Groundwater	Total (unfiltered) Tin Filtered Radium-228
Pond Sediment	Beryllium Cadmium Nickel Tritium

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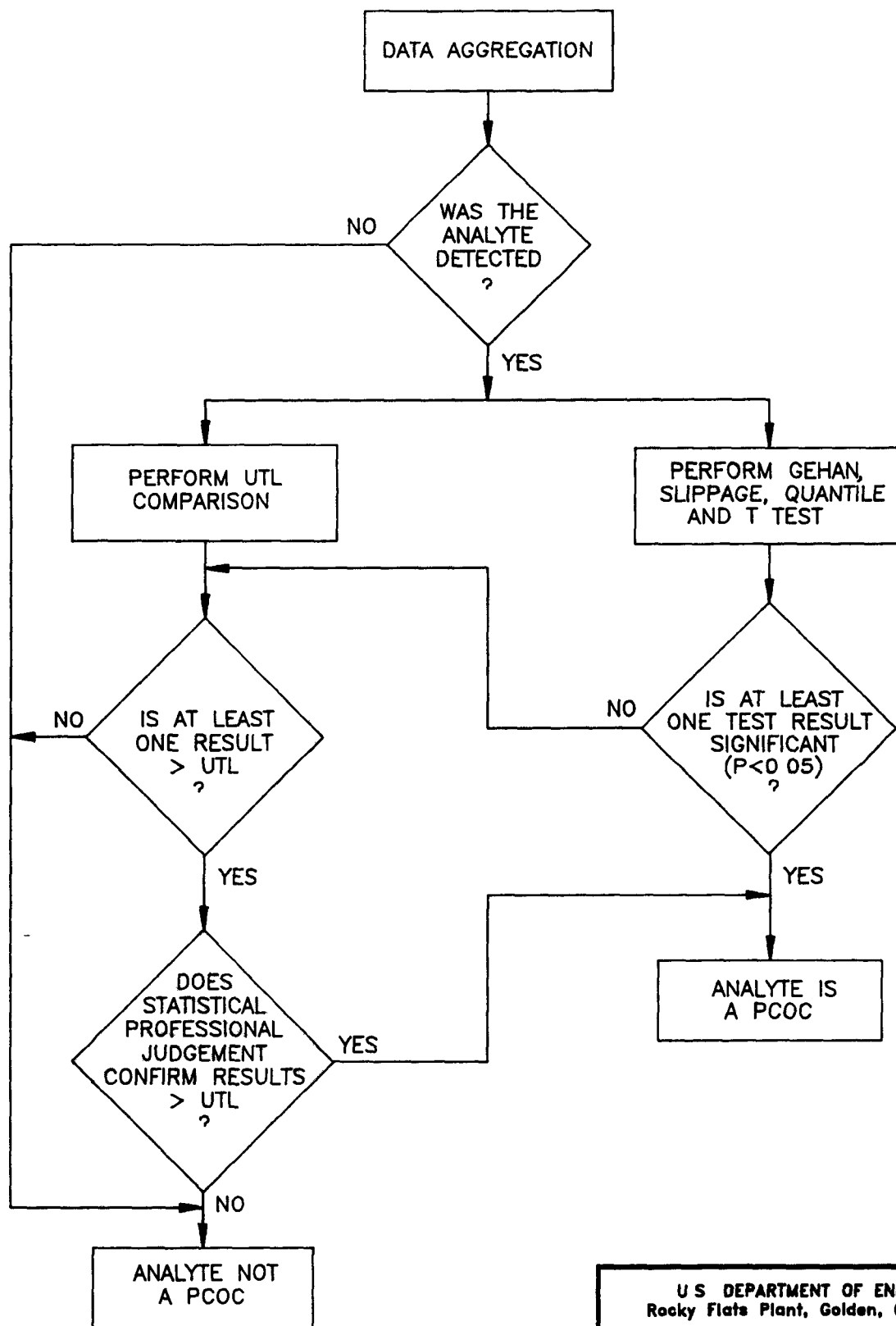
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UTL UPPER TOLERANCE LIMIT
OF BACKGROUND DATA (99/99)

PCOC POTENTIAL CHEMICAL OF
CONCERN

U S DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

OPERABLE UNIT NO 6
PHASE I RFI/RI REPORT

BACKGROUND COMPARISON
PROCESS

TABLE A-1
ROCKY FLATS PLANT OU-6
Background Comparison Summary

Media	Background Data	OU6 Data	Analyte Group	No of Analytes in Comparison	No of Analytes Significant in Tests	No of Analytes Greater than UTL 9999	No of PCOC
Surficial Soil	Rock Creek Surficial Soil	Surficial Soil & Dry Sediment	Metals Rads	28 7	9 2	15 5	16 4
Subsurface Soil	USHU Subsurface Soil	Subsurface Soil	Metals Rads	28 8	3 5	8 6	7 6
Groundwater	USHU*	Historic and New Wells	Total Metals	29	25	26	25
	Groundwater		Filtered Metals	28	13	17	17
	USHU	Historic and New Wells	Total Rads	11	4	5	5***
	Groundwater		Filtered Rads	11	7	6	8***
Pond Sediment	Seep/Spring Sediment	Pond Sediment	Metals Rads	27 12	11 10	7 8	12 10
Pond Surface Water	Seep/Spring*	Pond Surface Water	Total Metals	29	3	1	3
	Surface Water		Filtered Metals	28	4	4	4
	Seep/Spring	Pond Surface Water	Total Rads	10	4	2	4
	Surface Water		Filtered Rads	7	2	2	3***
Stream Sediment	Stream	Stream	Metals	26	11	2	11
	Sediment	Sediment	Rads	12	3	1	3***

* In these background data files, non-detect records with extremely high reporting limits were not used

** Background data files are from "1993 Background Geochemical Characterization Report " except for surficial soil

*** Some sample sizes too small to draw conclusion

TABLE A-2
ROCKY FLATS PLANT OU-6
OU-6 Background Comparison Summary of
Surficial Soil Metals
(Concentration Unit MG/KG)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	18	119	1.00	1.00	0.2320	0.7081	0.9976	1.0000	N	21915.4	3	NO	Not a PCOC by PJ (1)
ANTIMONY	18	103	0.00	0.54	1.0000		0.0174		Y	50.0	0	YES	
ARSENIC	18	119	1.00	1.00	0.4222	0.8522	0.8614	0.7828	N	12.9	0	NO	
BARIUM	18	119	1.00	1.00	1.0000	0.9975	0.9914	0.9912	N	528.0	0	NO	
BERYLLIUM	18	119	0.50	0.87	1.0000		0.4654		N	5.2	0	NO	
CADMIUM	17	119	0.35	0.47	0.8750		0.3602		N	5.0	1	NO	Not a PCOC by PJ (1)
CALCIUM	18	119	1.00	1.00	0.0001	0.0119	0.0001	0.0001	Y	13573.3	24	YES	
CESIUM	18	114	0.50	0.91	1.0000		0.2843		N	630.8	0	NO	
CHROMIUM	18	119	1.00	0.99	0.6532	0.9848	0.9998	1.0000	N	24.8	1	YES	
COBALT	18	119	1.00	1.00	1.0000	0.1921	0.0028	0.0057	Y	24.8	0	YES	
COPPER	18	119	1.00	1.00	0.0099	0.0119	0.0007	0.0001	Y	27.3	7	YES	
IRON	18	119	1.00	1.00	0.6532	0.4417	0.9190	0.8919	N	28160.4	3	YES	
LEAD	18	119	1.00	1.00	0.0909	0.4743	0.9995	1.0000	N	61.4	4	YES	
LITHIUM	18	119	1.00	0.97	0.1707		0.9889	0.9997	N	20.0	0	NO	
MAGNESIUM	18	119	1.00	1.00	0.4222	0.7081	0.3266	0.2969	N	7011.5	3	YES	
MANGANESE	18	119	1.00	1.00	1.0000	0.9557	0.9998	0.9999	N	2253.5	0	NO	
MERCURY	18	119	0.00	0.41	0.8686		0.0303		Y	0.2	1	YES	
MOLYBDENUM	18	119	0.06	0.01	1.0000		0.0185		Y	40.0	0	YES	
NICKEL	18	118	1.00	0.95	0.1228	0.4348	0.0308	0.1363	Y	26.9	0	YES	
POTASSIUM	18	119	1.00	0.92	0.8686	1.0000	1.0000	1.0000	N	5256.8	0	NO	
SELENIUM	18	119	0.72	0.27	1.0000		0.2903		N	1.4	0	NO	NO site measurement
SILICON	0	0	0.00	0.00									
SILVER	18	119	0.00	0.09	0.8686		0.2388		N	10.0	1	YES	
SODIUM	18	119	0.50	1.00	0.6532		0.0547		N	1108.0	3	YES	
STRONTIUM	18	119	1.00	1.00	0.2320	0.0769	0.0714	0.0397	Y	90.1	6	YES	
THALLIUM	18	118	0.28	0.42	1.0000		0.6887		N	2.0	0	NO	
TIN	18	119	0.50	0.03	1.0000		1.0000		N	75.9	0	NO	
VANADIUM	18	119	1.00	1.00	0.2700	0.2375	0.4443	0.5916	N	55.6	4	YES	
ZINC	18	119	1.00	1.00	0.0099	0.0119	0.1244	0.0028	Y	86.6	11	YES	

(1) Professional judgment based on log-normal UTL comparison

TABLE A-3
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Surficial Soil Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit MG/KG)

ANALYTE	N_B	N_S	ND_B	ND_S	DTF_B	DTF_S	MEAN_B	MEAN_S	STD_B	STD_S	UTL99	NGUTL	MAX_B	MAX_S	NGM	P_SLP	N_T20	N_SITE	P_QUAN	Z_CAL	Z_95	P_VAL
ALUMINUM	18	119	0	0	1.00	1.00	12886.1	10843.3	2279.9	4325.1	21915.4	3	17950.0	24100.0	10	0.2320	28	24	0.7081	2.826	1.645	0.9976
ANTIMONY	18	103	18	47	0.00	0.54	15.5	13.6	9.8	8.5	50.0	0	50.0	43.6	0	1.0000	999	999	999.0000	2.111	1.645	0.0174
ARSENIC	18	119	0	0	1.00	1.00	5.8	5.3	1.8	1.9	12.9	0	8.5	11.0	6	0.4222	29	24	0.8522	-1.087	1.645	0.8614
BARIUM	18	119	0	0	1.00	1.00	194.3	147.4	84.3	51.5	528.0	0	470.0	272.0	0	1.0000	28	20	0.9975	2.383	1.645	0.9914
BERYLLIUM	18	119	9	15	0.50	0.87	1.6	0.8	0.9	0.3	5.2	0	5.0	1.5	0	1.0000	999	999	999.0000	0.087	1.645	0.4654
CADMIUM	17	119	11	63	0.35	0.47	1.4	0.9	0.9	0.7	5.0	1	5.0	6.4	1	0.8750	999	999	999.0000	0.358	1.645	0.3602
CALCIUM	18	119	0	0	1.00	1.00	5022.2	11383.1	2159.2	9689.8	13573.3	24	8810.0	59800.0	59	0.0001	28	28	0.0119	4.078	1.645	0.0001
CESIUM	18	114	9	10	0.50	0.91	126.2	11.6	127.4	27.7	630.8	0	500.0	33.4	0	1.0000	999	999	999.0000	0.570	1.645	0.2843
CHROMIUM	18	119	0	1	1.00	0.99	15.0	11.8	2.5	4.6	24.8	1	20.2	35.1	3	0.6532	29	22	0.9848	3.562	1.645	0.9998
COBALT	18	119	0	0	1.00	1.00	7.8	8.7	4.3	2.7	24.8	0	24.0	20.3	0	1.0000	30	28	0.1921	2.775	1.645	0.0028
COPPER	18	119	0	0	1.00	1.00	13.0	17.9	3.6	8.0	27.3	7	18.5	61.6	29	0.0099	28	28	0.0119	3.189	1.645	0.0007
IRON	18	119	0	0	1.00	1.00	15381.7	14451.3	3226.6	4460.8	28160.4	3	24900.0	34600.0	3	0.6532	29	26	0.4417	1.399	1.645	0.9190
LEAD	18	119	0	0	1.00	1.00	37.5	29.2	6.0	15.4	61.4	4	51.0	68.7	16	0.0909	28	25	0.4743	3.269	1.645	0.9995
LITHIUM	18	119	0	4	1.00	0.97	11.0	9.2	2.3	3.4	20.0	0	15.0	18.1	12	0.1707	999	999	999.0000	2.288	1.645	0.9889
MAGNESIUM	18	119	0	0	1.00	1.00	2853.3	3078.3	1049.9	1571.8	7011.5	3	5195.0	11400.0	6	0.4222	28	24	0.7081	0.449	1.645	0.3266
MANGANESE	18	119	0	0	1.00	1.00	443.5	265.0	457.0	114.5	2253.5	0	2220.0	823.0	0	1.0000	28	22	0.9557	3.546	1.645	0.9998
MERCURY	18	119	18	70	0.00	0.41	0.1	0.1	0.0	0.0	0.2	1	0.2	0.3	1	0.8686	999	999	999.0000	1.877	1.645	0.0303
MOLYBDENUM	18	119	17	118	0.06	0.01	14.0	19.9	5.7	0.9	40.0	0	40.0	9.9	0	1.0000	999	999	999.0000	2.085	1.645	0.0185
NICKEL	18	118	0	6	1.00	0.95	12.3	14.0	3.7	4.2	26.9	0	18.7	22.5	14	0.1228	29	26	0.4348	1.869	1.645	0.0308
POTASSIUM	18	119	0	9	1.00	0.92	2977.9	2103.5	575.4	844.0	5256.8	0	4205.0	4430.0	1	0.8686	28	17	1.0000	-4.155	1.645	1.0000
SELENIUM	18	119	5	87	0.72	0.27	0.6	0.5	0.2	0.1	1.4	0	2.0	1.3	0	1.0000	999	999	999.0000	0.553	1.645	0.2903
SILICON(1)																						
SILVER	18	119	18	108	0.00	0.09	3.0	1.7	2.1	4.8	10.0	1	10.0	52.7	1	0.8686	999	999	999.0000	0.710	1.645	0.2388
SODIUM	18	119	9	0	0.50	1.00	305.6	197.2	202.6	216.7	1108.0	3	1000.0	1650.0	3	0.6532	999	999	999.0000	1.601	1.645	0.0547
STRONTIUM	18	119	0	0	1.00	1.00	35.3	45.8	13.8	29.9	90.1	6	79.1	255.0	10	0.2320	28	27	0.0769	1.465	1.645	0.0714
THALLIUM	18	118	13	69	0.28	0.42	0.8	0.7	0.3	0.3	2.0	0	2.0	0.6	0	1.0000	999	999	999.0000	0.492	1.645	0.6887
TIN	18	119	9	116	0.50	0.03	31.4	20.2	11.2	1.8	75.9	0	100.0	38.7	0	1.0000	999	999	999.0000	-4.620	1.645	1.0000
VANADIUM	18	119	0	0	1.00	1.00	31.6	32.5	6.0	10.7	55.6	4	45.6	75.9	9	0.2700	28	26	0.2375	0.140	1.645	0.4443
ZINC	18	119	0	0	1.00	1.00	55.8	68.5	7.8	60.7	86.6	11	70.6	650.0	29	0.0099	28	28	0.0119	1.153	1.645	0.1244

(1) No site measurement

TABLE A-4
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
Surficial Soil Radionuclides
(Concentration Unit pCi/G)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	15	105	1 00	1 00	0 0001	0 0277	0 0001		Y	0 060	63	YES	
CESIUM-137	12	18	1 00	1 00	1 0000	1 0000	1 0000		N	3 699	0	NO	
GROSS ALPHA	9	134	1 00	1 00	0 4760	0 9174	0 9847		N	42 220	3	YES	
GROSS BETA	18	134	1 00	1 00	0 3111	0 8711	0 9778		N	54 120	2	YES	
PLUTONIUM-239,240	18	118	1 00	1 00	0 0001	0 0114	0 0001		Y	0 133	73	YES	
RADIUM-226	10	0	0 00	0 00									NO site measurement
RADIUM 228	10	0	0 00	0 00									NO site measurement
STRONTIUM-89 90	9	18	1 00	1 00	1 0000	1 0000	0 9992		N	2 217	0	NO	
TRITIUM (1)	0	27	0 00	0 00									NO BKGD measurement
URANIUM TOTAL	0	0	0 00	0 00									NO measurements
URANIUM-233,234	13	125	1 00	1 00	0 2893	0 7453	0 9844		N	1 826	1	NO	Not a PCOC by PJ (2)
URANIUM-235	13	125	1 00	1 00	0 4433	0 7453	0 5160		N	0 179	0	NO	
URANIUM-238	13	125	1 00	1 00	0 4922	0 9064	0 9788		N	2 086	0	NO	

(1) Concentration unit pCi/L

(2) Professional judgment based on log-normal UTL comparison

TABLE A-5
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Surficial Soil Radionuclides
(Shippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/G)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL	99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
AMERICIUM 241	15	105	0	0	0	1.00	1.00	1.00	1.00	0.019	0.376	0.010	0.601	0.060	63	0.040	3.243	72	0.0001	24	24	0.0277	4.575	1.645	0.0001																	
CESIUM 137	12	18	0	0	0	1.00	1.00	1.00	1.00	1.418	0.188	0.492	0.159	3.699	0	2.500	0.570	0	1.0000	6	0	1.0000	4.573	1.645	1.0000																	
GROSS ALPHA	9	134	0	0	0	1.00	1.00	1.00	1.00	20.833	20.027	3.969	19.453	42.220	3	28.000	186.000	11	0.4760	29	26	0.9174	2.161	1.645	0.9847																	
GROSS BETA	18	134	0	0	0	1.00	1.00	1.00	1.00	32.231	30.173	5.527	7.462	54.120	2	40.000	71.700	9	0.3111	31	26	0.8711	2.010	1.645	0.9778																	
PLUTONIUM 239 240	18	118	0	0	0	1.00	1.00	1.00	1.00	0.054	0.994	0.020	1.949	0.133	73	0.100	15.220	78	0.0001	28	28	0.0114	4.862	1.645	0.0001																	
RADIUM 226(1)	10	0	0	0	0																																					
RADIUM 228(1)	10	0	0	0	0																																					
STRONTIUM 89 90	9	18	0	0	0	1.00	1.00	1.00	1.00	0.619	0.194	0.297	0.122	2.217	0	1.000	0.500	0	1.0000	6	0	1.0000	3.143	1.645	0.9992																	
TRITIUM(2.3)	0	27	0	0	0																																					
URANIUM TOTAL(4)	0	0	0	0	0																																					
URANIUM 233 234	13	125	0	0	0	1.00	1.00	1.00	1.00	1.167	1.048	0.147	0.284	1.826	1	1.470	2.020	12	0.2893	28	25	0.7453	2.154	1.645	0.9844																	
URANIUM 235	13	125	0	0	0	1.00	1.00	1.00	1.00	0.047	0.046	0.030	0.030	0.179	0	0.100	0.160	8	0.4433	28	25	0.7453	0.040	1.645	0.5160																	
URANIUM 238	13	125	0	0	0	1.00	1.00	1.00	1.00	1.200	1.077	0.198	0.293	2.086	0	1.520	2.082	7	0.4922	28	24	0.9064	2.030	1.645	0.9788																	

- (1) No site measurement
(2) Concentration Unit pCi/L
(3) No detect record from site
(4) No background measurement

TABLE A-6
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
Subsurface Soil Metals
(Concentration Unit MG/KG)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	98	231	1.00	1.00	1.0000	1.0000	1.0000	1.0000	N	45083.1	0	NO	
ANTIMONY	66	210	0.18	0.07	1.0000		0.1658		N	47.0	0	NO	
ARSENIC	99	231	0.81	0.99	1.0000	0.8480	0.3116	0.7957	N	17.0	0	NO	
BARIUM	99	231	0.92	1.00	0.1153	0.0006	0.0001	0.0004	Y	371.1	17	YES	
BERYLLIUM	99	231	0.91	0.84	1.0000	1.0000	1.0000	1.0000	N	18.2	0	NO	
CADMIUM	81	211	0.48	0.08	1.0000		1.0000		N	2.0	0	NO	
CALCIUM	99	231	0.90	1.00	0.0385	0.0001	0.0001	0.0001	Y	53248.1	52	YES	
CESIUM	95	221	0.78	0.68	1.0000		1.0000		N	1014.9	0	NO	
CHROMIUM	99	231	1.00	0.98	0.7000	1.0000	1.0000	0.9998	N	89.1	3	YES	
COBALT	99	231	0.34	0.95	1.0000		0.9996		N	38.1	0	NO	
COPPER	99	231	0.97	1.00	1.0000	0.9931	0.9998	0.9978	N	49.0	1	NO	Not a PCOC by PJ (1)
IRON	99	231	1.00	1.00	1.0000	0.9999	1.0000	0.9999	N	52385.2	0	NO	
LEAD	99	231	1.00	1.00	0.4894	0.9548	0.1262	0.2347	N	31.0	2	YES	
LITHIUM	99	209	0.48	0.87	1.0000		1.0000		N	41.9	0	NO	
MAGNESIUM	99	231	0.71	1.00	1.0000	0.8663	0.5539		N	12147.1	0	NO	
MANGANESE	99	231	1.00	1.00	1.0000	0.9998	0.9998	0.9813	N	1194.0	0	NO	
MERCURY	86	231	0.38	0.31	1.0000		1.0000		N	2.1	0	NO	
MOLYBDENUM	99	231	0.18	0.02	1.0000		0.9848		N	67.6	0	NO	
NICKEL	96	231	0.96	0.66	1.0000	1.0000	1.0000		N	79.9	0	NO	
POTASSIUM	98	230	0.40	0.60	1.0000		1.0000		N	8362.3	0	NO	
SELENIUM	82	211	0.27	0.09	1.0000		1.0000		N	7.1	0	NO	NO site measurement
SILICON													
SILVER	83	230	0.43	0.00	1.0000		1.0000		N	33.1	0	NO	
SODIUM	99	231	0.18	1.00	1.0000		0.9989		N	3680.0	0	NO	
STRONTIUM	99	231	0.43	1.00	0.7000		0.0003		Y	269.9	6	YES	
THALLIUM	75	223	0.05	0.29	1.0000		0.8231		N	20.0	0	NO	
TIN	92	231	0.23	0.03	1.0000		1.0000		N	383.7	0	NO	
VANADIUM	99	231	0.98	1.00	1.0000	0.9998	1.0000	0.9982	N	112.8	1	YES	
ZINC	98	231	1.00	1.00	0.7021	0.9259	0.8970	0.6826	N	182.9	4	YES	

(1) Professional judgment based on log-normal UTL comparison

TABLE A-7
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Subsurface Soil Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit MG/KG)

ANALYTE	N_B	N_S	ND_B	ND_S	DTF_B	DTF_S	MEAN_B	MEAN_S	STD_B	STD_S	UTL99	NGUTL	MAX_B	MAX_S	NGM	P_SLP	N_T20	N_SITE	P_QUAN	Z_CAL	Z_95	P_VAL
ALUMINUM	98	231	0	0	1.00	1.00	12752.0	7249.3	11310.6	3521.4	45083.1	0	102000.0	24100.0	0	1.000	66	26	1.0000	7.040	1.645	1.0000
ANTIMONY	66	210	54	195	0.18	0.07	7.0	6.7	5.4	2.7	47.0	0	47.0	21.7	0	1.000	999	999	999.0000	0.971	1.645	0.1658
ARSENIC	99	231	19	2	0.81	0.99	4.0	3.6	4.6	1.8	17.0	0	41.8	10.9	0	1.000	70	46	0.8480	0.491	1.645	0.3116
BARIUM	99	231	8	0	0.92	1.00	97.0	160.8	96.0	246.5	371.1	17	777.0	2970.0	6	0.115	66	57	0.0006	3.979	1.645	0.0001
BERYLLIUM	99	231	9	37	0.91	0.84	4.8	0.7	4.7	0.3	18.2	0	23.5	2.1	0	1.000	68	0	1.0000	13.704	1.645	1.0000
CADMIUM	81	211	42	195	0.48	0.08	0.9	0.5	0.4	0.2	2.0	0	2.4	1.8	0	1.000	999	999	999.0000	8.903	1.645	1.0000
CALCIUM	99	231	10	0	0.90	1.00	6995.8	36724.9	16198.9	45552.6	53248.1	52	157000.0	203000.0	9	0.039	66	65	0.0001	8.752	1.645	0.0001
CESIUM	95	221	21	71	0.78	0.68	2307	34.5	273.4	44.9	1014.9	0	2830.0	33.7	0	1.000	999	999	999.0000	14.089	1.645	1.0000
CHROMIUM	99	231	0	4	1.00	0.98	19.6	10.8	24.3	18.6	89.1	3	176.0	217.0	1	0.700	66	23	1.0000	8.558	1.645	1.0000
COBALT	99	231	65	12	0.34	0.95	8.6	6.4	10.3	3.0	38.1	0	93.9	21.4	0	1.000	999	999	999.0000	3.366	1.645	0.9996
COPPER	99	231	3	0	0.97	1.00	12.7	9.7	12.7	5.9	49.0	1	123.0	52.1	0	1.000	67	39	0.9931	3.567	1.645	0.9998
IRON	99	231	0	0	1.00	1.00	14532.0	9171.4	13257.3	5212.0	52385.2	0	132000.0	42000.0	0	1.000	67	34	0.9999	6.646	1.645	1.0000
LEAD	99	231	0	1	1.00	1.00	10.9	11.5	7.0	7.8	31.0	2	39.8	84.9	2	0.489	66	41	0.9548	1.145	1.645	0.1262
LITHIUM	99	209	51	27	0.48	0.87	14.7	9.5	9.5	5.6	41.9	0	83.2	29.8	0	1.000	999	999	999.0000	-4.607	1.645	1.0000
MAGNESIUM	99	231	29	0	0.71	1.00	2706.5	2450.4	3306.4	970.5	12147.1	0	32500.0	6090.0	0	1.000	66	43	0.8663	-0.135	1.645	0.5539
MANGANESE	99	231	0	0	1.00	1.00	217.6	143.4	342.0	119.8	1194.0	0	3330.0	907.0	0	1.000	67	35	0.9998	3.546	1.645	0.9998
MERCURY	86	231	53	159	0.38	0.31	0.3	0.1	0.6	0.1	2.1	0	5.9	0.9	0	1.000	999	999	999.0000	5.743	1.645	1.0000
MOLYBDENUM	99	231	81	227	0.18	0.02	18.3	19.8	7.6	1.9	67.6	0	67.6	27.9	0	1.000	999	999	999.0000	2.164	1.645	0.9848
NICKEL	96	231	4	79	0.96	0.66	20.9	10.5	20.6	6.7	79.9	0	193.0	41.5	0	1.000	67	28	1.0000	7.444	1.645	1.0000
POTASSIUM	98	230	59	93	0.40	0.60	1627.4	913.8	2356.1	473.2	8362.3	0	18700.0	3030.0	0	1.000	999	999	999.0000	-4.488	1.645	1.0000
SELENIUM	82	211	60	192	0.27	0.09	1.5	0.5	1.9	0.1	7.1	0	13.7	1.3	0	1.000	999	999	999.0000	7.883	1.645	1.0000
SILICON(1)																						
SILVER	83	230	47	229	0.43	0.00	5.8	1.0	9.4	0.1	33.1	0	40.9	2.7	0	1.000	999	999	999.0000	10.074	1.645	1.0000
SODIUM	99	231	81	0	0.18	1.00	866.8	158.0	441.1	129.3	3680.0	0	3680.0	970.0	0	1.000	999	999	999.0000	3.069	1.645	0.9989
STRONTIUM	99	231	56	1	0.43	1.00	69.2	81.3	70.3	74.8	269.9	6	484.0	506.0	1	0.700	999	999	999.0000	3.395	1.645	0.0003
THALLIUM	75	223	71	158	0.05	0.29	1.3	0.8	1.2	0.3	20.0	0	20.0	0.7	0	1.000	999	999	999.0000	-0.927	1.645	0.8231
TIN	92	231	71	223	0.23	0.03	66.6	20.4	110.2	3.4	383.7	0	441.0	57.8	0	1.000	999	999	999.0000	6.293	1.645	1.0000
VANADIUM	99	231	2	0	0.98	1.00	31.5	22.7	28.5	11.8	112.8	1	283.0	118.0	0	1.000	67	35	0.9998	-4.486	1.645	1.0000
ZINC	98	231	0	0	1.00	1.00	36.9	33.9	51.1	53.5	182.9	4	486.0	706.0	1	0.702	66	42	0.9259	1.265	1.645	0.8970

(1) No site measurement

TABLE A-8
ROCKY FLATS PLANT OU-6
Background Comparison t Test Results of
Subsurface Soil Metals
(Concentration Unit MG/KG)

ANALYTE	N_B	N_S	ND_B	ND_S	MEAN_B	MEAN_S	STD_B	STD_S	F_CALC	F_TAB	DF	T_CALC	T_1.95	P_T_1	REMARK
ALUMINUM	98	231	0	0	12752.0	7249.3	11310.6	3521.4	25.7	3.8	105	-4.720	1.66	1.0000	
ANTIMONY	66	210	54	195	7.0	6.7	5.4	2.7							NNDT more than 20%
ARSENIC	99	231	19	2	4.0	3.6	4.6	1.8	9.4	3.8	111	-0.829	1.66	0.7957	
BARIUM	99	231	8	0	97.0	160.8	96.0	246.5	6.7	3.8	326	3.382	1.65	0.0004	
BERYLLIUM	99	231	9	37	4.8	0.7	4.7	0.3	182.2	3.8	98	-8.613	1.66	1.0000	
CADMIUM	81	211	42	195	0.9	0.5	0.4	0.2							NNDT more than 20%
CALCIUM	99	231	10	0	6995.8	36724.9	16198.9	45552.6	78.1	3.8	320	8.716	1.65	0.0001	
CESIUM	95	221	21	71	230.7	34.5	273.4	44.9							NNDT more than 20%
CHROMIUM	99	231	0	4	19.6	10.8	24.3	18.6	2.6	3.8	328	-3.570	1.65	0.9998	
COBALT	99	231	65	12	8.6	6.4	10.3	3.0							NNDT more than 20%
COPPER	99	231	3	0	12.7	9.7	12.7	5.9	3.6	3.8	328	-2.874	1.65	0.9978	
IRON	99	231	0	0	14532.0	9171.4	13257.3	5212.0	5.9	3.8	111	-3.896	1.66	0.9999	
LEAD	99	231	0	1	10.9	11.5	7.0	7.8	1.5	3.8	328	0.724	1.65	0.2347	
LITHIUM	99	209	51	27	14.7	9.5	9.5	5.6							NNDT more than 20%
MAGNESIUM	99	231	29	0	2706.5	2450.4	3306.4	970.5							NNDT more than 20%
MANGANESE	99	231	0	0	217.6	143.4	342.0	119.8	6.7	3.8	108	-2.107	1.66	0.9813	
MERCURY	86	231	53	159	0.3	0.1	0.6	0.1							NNDT more than 20%
MOLYBDENUM	99	231	81	227	18.3	19.8	7.6	1.9							NNDT more than 20%
NICKEL	96	231	4	79	20.9	10.5	20.6	6.7							NNDT more than 20%
POTASSIUM	98	230	59	93	1627.4	913.8	2356.1	473.2							NNDT more than 20%
SELENIUM	82	211	60	192	1.5	0.5	1.9	0.1							NNDT more than 20%
SILICON	0	0	0	0											NO BKGD measurement
SILVER	83	230	47	229	5.8	1.0	9.4	0.1							NNDT more than 20%
SODIUM	99	231	81	0	866.8	158.0	441.1	129.3							NNDT more than 20%
STRONTIUM	99	231	56	1	69.2	81.3	70.3	74.8							NNDT more than 20%
THALLIUM	75	223	71	158	1.3	0.8	1.2	0.3							NNDT more than 20%
TIN	92	231	71	223	66.6	20.4	110.2	3.4							NNDT more than 20%
VANADIUM	99	231	2	0	31.5	22.7	28.5	11.8	6.3	3.8	113	-2.979	1.66	0.9982	
ZINC	98	231	0	0	36.9	33.9	51.1	53.5	0.1	3.8	327	-0.475	1.65	0.6826	

TABLE A-9
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
Subsurface Soil Radionuclides
(Concentration Unit pCi/G)

ANALYTE	N	B	N	S	DTF	B	DTF	S	P	SLIP	P	QUAN	P	GEHAN	P	T	1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK	
AMERICIUM-241	28	208	1	00	1	00	1	00	0	0001	0	0009	0	0001	0	0228	Y		0	022	21	YES	
CESIUM-137	99	0																					NO site measurement
GROSS ALPHA	99	209	1	00	1	00	1	00	0	4597	1	0000	1	0000	1	0000	N		51	423	2	YES	
GROSS BETA	99	223	1	00	1	00	1	00	1	0000	1	0000	1	0000	1	0000	N		42	022	0	NO	
PLUTONIUM-239,240	99	206	1	00	1	00	1	00	0	0001	0	0001	0	0001	0	0001	Y		0	025	43	YES	
RADIUM-226	83	0																					NO site measurement
RADIUM-228	83	0																					NO site measurement
STRONTIUM-89,90	99	0																					NO site measurement
TRITIUM (1)	99	12	1	00	1	00	1	00	1	0000	0	9479	0	9564			N		503	616	0	NO	
URANIUM TOTAL	0	0																					NO site measurement
URANIUM-233 234	99	230	1	00	1	00	1	00	1	0000	0	0256	0	0344	0	2701	Y		3	441	0	YES	
URANIUM-235	99	230	1	00	1	00	1	00	1	0000	0	4617	0	0001	0	0009	Y		0	153	1	YES	
URANIUM-238	99	230	1	00	1	00	1	00	0	6991	0	8497	0	3157	0	2637	N		1	807	2	YES	

(1) Concentration Unit pCi/L

TABLE A-10
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Subsurface Soil Radionuclides
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/G)

ANALYTE	N_B	N_S	ND_B	ND_S	DTF_B	DTF_S	MEAN_B	MEAN_S	STD_B	STD_S	UTL99	NGUTL	MAX_B	MAX_S	NGM	P_SLP	N_T20	N_SITE	P_QUAN	Z_CAL	Z_95	P_VAL
AMERICIUM 241	28	208	0	0	1.00	1.00	-0.002	0.013	0.007	0.040	0.022	21	0.010	0.440	63	0.0001	49	49	0.0009	6.390	1.645	0.0001
CESIUM 137(1)	99	0	0	0	1.00	1.00	0.012	0.041														
GROSS ALPHA	99	209	0	0	1.00	1.00	24.915	14.138	9.284	10.768	51.423	2	48.000	143.000	2	0.4597	64	9	1.0000	10.266	1.645	1.0000
GROSS BETA	99	223	0	0	1.00	1.00	24.717	20.794	6.061	5.275	42.022	0	44.000	36.560	0	1.0000	67	28	1.0000	5.530	1.645	1.0000
PLUTONIUM 239 240	99	206	0	0	1.00	1.00	0.004	0.029	0.007	0.085	0.025	43	0.030	0.880	37	0.0001	61	53	0.0001	5.355	1.645	0.0001
RADIUM 226(1)	83	0	0	0	1.00	1.00	0.746		0.231													
RADIUM 228(1)	83	0	0	0	1.00	1.00	1.402		0.318													
STRONTIUM 89 90(1)	99	0	0	0	1.00	1.00	0.031		0.358													
TRITIUM (2)	99	12	0	0	1.00	1.00	141.717	79.093	126.747	101.881	503.616	0	440.000	250.500	0	1.0000	23	1	0.9479	1.710	1.645	0.9564
URANIUM TOTAL(3)	0	0	0	0																		
URANIUM 233 234	99	230	0	0	1.00	1.00	0.779	0.715	0.932	0.302	3.441	0	8.900	3.050	0	1.0000	66	53	0.0256	1.819	1.645	0.0344
URANIUM 235	99	230	0	0	1.00	1.00	0.022	0.037	0.046	0.032	0.153	1	0.200	0.160	0	1.0000	66	47	0.4617	7.487	1.645	0.0001
URANIUM 238	99	230	0	0	1.00	1.00	0.733	1.333	0.376	9.254	1.807	2	3.200	141.000	1	0.6991	76	50	0.8497	0.480	1.645	0.3157

(1) No site measurement

(2) Concentration Unit pCi/L

(3) No background measurement

TABLE A-11
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
UHSU Groundwater Total Metals
(Concentration Unit UG/L)

ANALYTE	N	B	N	S	DTF_B	DTF_S	P	SLIP	P	QUAN	P	GEHAN	P	T_1	SIGNIFIC	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	149	106			0.95	0.95	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0007	Y	Y	25624.6	18	YES	
ANTIMONY	141	92			0.38	0.16	0.0090					0.0211		Y	Y	55.8	7	YES	
ARSENIC	138	106			0.28	0.52	0.0147					0.0001		Y	Y	8.8	6	YES	
BARIUM	149	107			0.74	0.98	0.0001	0.0001				0.0001		Y	Y	300.4	32	YES	
BERYLLIUM	148	100			0.12	0.30	0.0002					0.0001		Y	Y	5.0	9	YES	
CADMIUM	148	106			0.20	0.26	0.0049					0.0177		Y	Y	11.1	6	YES	
CALCIUM	149	107			1.00	1.00	0.0001	0.0001				0.0001	0.0001	Y	Y	145353.0	32	YES	
CESIUM	142	97			0.25	0.02	1.0000					0.1380		N	N	934.7	0	NO	
CHROMIUM	145	107			0.48	0.75	1.0000	0.0001				0.0001		Y	Y	186.4	7	YES	
COBALT	148	107			0.16	0.45	0.0020					0.0001		Y	Y	50.0	7	YES	
COPPER	148	107			0.74	0.54	0.0001					0.0001		Y	Y	45.3	20	YES	
IRON	149	106			0.98	0.95	0.0019	0.0001				0.0001	0.0012	Y	Y	31518.5	18	YES	
LEAD	141	107			0.70	0.73	0.0002	0.0001				0.0001		Y	Y	19.3	21	YES	
LITHIUM	149	107			0.77	0.93	0.0008					0.0001		Y	Y	172.3	17	YES	
MAGNESIUM	149	107			0.97	1.00	0.0001	0.0001				0.0001	0.0001	Y	Y	33005.6	42	YES	
MANGANESE	149	107			0.89	0.94	0.0001	0.0001				0.0001	0.0001	Y	Y	626.4	30	YES	
MERCURY	148	107			0.20	0.10	0.0008					0.9745		Y	Y	0.2	9	YES	
MOLYBDENUM	150	107			0.34	0.27	1.0000					0.0738		N	N	195.1	0	NO	
NICKEL	146	107			0.38	0.66	0.1779					0.0001		Y	Y	97.5	12	YES	
POTASSIUM	150	107			0.71	0.94	0.0001					0.0001		Y	Y	5178.8	39	YES	
SELENIUM	145	106			0.30	0.58	0.4223	0.0001				0.0001		Y	Y	127.5	18	YES	
SILICON	84	66			0.99	1.00	0.0011	0.0001				0.0258	0.0005	Y	Y	61390.0	12	YES	
SILVER	147	104			0.16	0.20	0.0003					0.0017		Y	Y	10.0	9	YES	
SODIUM	149	107			0.99	1.00	0.0001	0.0001				0.0001	0.0001	Y	Y	144226.0	26	YES	
STRONTIUM	146	106			0.89	1.00	0.0001	0.0001				0.0001	0.0001	Y	Y	1085.4	33	YES	
THALLIUM	146	107			0.24	0.05	1.0000					0.5107		N	N	9.0	0	NO	
TIN	149	106			0.35	0.19	0.1718					0.2361		N	N	179.2	3	NO	Not a PCOC by PI (1)
VANADIUM	149	107			0.77	0.74	0.0003					0.0001		Y	Y	68.2	19	YES	
ZINC	149	107			0.91	0.83	0.0008	0.0001				0.0001	0.0142	Y	Y	179.2	22	YES	

(1) Professional judgment based on log-normal UTL comparison

TABLE A-12
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
UHSU Groundwater Total Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit UG/L)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL	99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
ALUMINUM	149	106	8	87	77	0.95	0.95	0.38	0.16	0.95	3496.5	268	20830.0	7758.2	53968.8	25624.6	18	63900.0	456000.0	10	0.000	51	35	0.0001	4.719	1.645	0.0001															
ANTIMONY	141	92	87	99	51	0.28	0.38	0.28	0.52	0.16	26.8	3.9	35.1	10.2	30.3	55.8	7	86.6	194.0	5	0.009	999	999	999	2.031	1.645	0.0211															
ARSENIC	138	106	99	39	2	0.74	0.98	0.74	0.98	0.52	105.9	105.9	353.7	68.2	608.5	300.4	6	10.0	18.0	5	0.015	999	999	999	5.257	1.645	0.0001															
BERYLLIUM	148	100	130	70	70	0.12	0.30	0.12	0.30	0.30	2.3	2.3	3.4	0.6	4.4	5.0	32	752.0	5060.0	10	0.000	52	47	0.0001	8.551	1.645	0.0001															
CADMIUM	148	106	119	78	78	0.20	0.26	0.20	0.26	0.26	2.5	2.5	3.4	1.0	4.2	11.1	6	11.1	32.9	9	0.000	999	999	999	4.077	1.645	0.0001															
CALCIUM	149	107	0	107	95	1.00	1.00	1.00	1.00	1.00	55030.2	378.2	177129.9	31667.8	172674.0	145353.0	32	186000.0	715000.0	24	0.000	52	42	0.0001	10.444	1.645	0.0177															
CESIUM	142	97	107	75	27	0.48	0.75	0.48	0.75	0.02	378.2	13.5	448.6	195.1	101.5	934.7	0	1000.0	150.0	0	1.000	999	999	999	1.089	1.645	0.1380															
CHROMIUM	145	107	75	27	27	0.16	0.45	0.16	0.45	0.75	13.5	21.9	24.1	7.4	27.7	50.0	7	729.0	580.0	0	1.000	51	42	0.0001	6.240	1.645	0.0001															
COBALT	148	107	124	59	49	0.74	0.54	0.74	0.54	0.02	11.4	11.4	117.8	11.9	646.9	45.3	20	105.0	228.0	7	0.002	999	999	999	3.641	1.645	0.0001															
COPPER	148	107	39	49	49	0.98	0.95	0.98	0.95	0.95	3909.1	3909.1	26939.2	9680.1	75639.4	31518.5	18	97000.0	656000.0	11	0.000	999	999	999	4.018	1.645	0.0001															
IRON	149	106	3	5	5	0.70	0.73	0.70	0.73	0.73	3.8	3.8	18.5	5.4	39.3	19.3	21	52.5	254.0	7	0.002	51	35	0.0001	4.778	1.645	0.0001															
LEAD	141	107	43	29	29	0.77	0.93	0.77	0.93	0.93	34.0	18.7	85.9	48.5	101.1	172.3	17	266.0	456.0	10	0.000	50	38	0.0001	4.611	1.645	0.0001															
LITHIUM	149	107	34	8	8	0.34	0.27	0.34	0.27	0.27	66.0	18.7	61.4	45.3	45.7	195.1	0	200.0	29.5	8	0.001	999	999	999	8.382	1.645	0.0001															
MAGNESIUM	149	107	4	0	0	0.97	1.00	0.97	1.00	1.00	10317.4	92.4	52059.5	7954.6	56654.4	33005.6	42	47900.0	235000.0	25	0.000	52	48	0.0001	11.518	1.645	0.0001															
MANGANESE	149	107	17	6	6	0.89	0.94	0.89	0.94	0.94	92.4	92.4	697.3	187.2	1204.1	626.4	30	1950.0	6200.0	12	0.000	52	42	0.0001	4.532	1.645	0.0001															
MERCURY	148	107	118	96	96	0.20	0.10	0.20	0.10	0.10	0.1	0.1	0.2	0.0	0.2	0.2	9	0.3	1.5	8	0.001	999	999	999	1.951	1.645	0.9745															
MOLYBDENUM	150	107	99	78	78	0.38	0.34	0.38	0.34	0.34	66.0	18.7	61.4	45.3	45.7	195.1	0	200.0	29.5	0	1.000	999	999	999	1.448	1.645	0.0738															
NICKEL	146	107	91	36	36	0.38	0.66	0.38	0.66	0.66	18.7	18.7	52.5	27.6	118.0	97.5	12	334.0	1070.0	2	0.178	999	999	999	6.817	1.645	0.0001															
POTASSIUM	150	107	44	6	6	0.71	0.94	0.71	0.94	0.94	1843.2	8.5	5797.4	1169.5	6613.6	5178.8	39	8370.0	38900.0	21	0.000	999	999	999	8.295	1.645	0.0001															
SELENIUM	145	106	101	44	44	0.30	0.58	0.30	0.58	0.58	8.5	8.5	48.9	41.7	104.3	127.5	18	456.0	475.0	1	0.422	51	36	0.0001	5.289	1.645	0.0001															
SILICON	84	66	1	0	0	0.99	1.00	0.99	1.00	1.00	16575.3	47	40453.3	15401.0	55239.6	61390.0	12	116000.0	288000.0	8	0.001	30	23	0.0001	1.946	1.645	0.0258															
SILVER	147	104	123	83	83	0.16	0.20	0.16	0.20	0.20	4.7	4.7	59.7	1.0	342.8	10.0	9	10.0	3040.0	9	0.000	999	999	999	2.922	1.645	0.0017															
SODIUM	149	107	2	0	0	0.99	1.00	0.99	1.00	1.00	30081.9	312.9	110537.7	40019.7	113020.0	144226.0	26	194000.0	549000.0	18	0.000	52	40	0.0001	9.348	1.645	0.0001															
STRONTIUM	146	106	16	0	0	0.89	1.00	0.89	1.00	1.00	312.9	3.9	1492.2	270.9	1742.5	1085.4	33	1770.0	6960.0	21	0.000	51	43	0.0001	10.770	1.645	0.0001															
THALLIUM	146	107	111	102	102	0.24	0.05	0.24	0.05	0.05	3.9	3.9	4.1	1.8	9.0	9.0	0	10.0	2.7	0	1.000	999	999	999	-0.027	1.645	0.5107															
TIN	149	106	97	86	86	0.35	0.19	0.35	0.19	0.19	70.4	70.4	82.0	38.2	44.7	179.2	3	200.0	267.0	2	0.172	999	999	999	0.719	1.645	0.2361															
VANADIUM	149	107	35	28	28	0.77	0.74	0.77	0.74	0.74	15.1	15.1	57.5	18.6	107.6	68.2	19	167.0	754.0	9	0.000	999	999	999	6.708	1.645	0.0001															
ZINC	149	107	14	18	18	0.91	0.83	0.91	0.83	0.83	37.1	37.1	219.9	49.8	850.0	179.2	22	498.0	8000.0	8	0.001	52	39	0.0001	3.747	1.645	0.0001															

TABLE A-13
ROCKY FLATS PLANT OU-6
Background Comparison t Test Results of
UHSU Groundwater Total Metals
 (Concentration Unit UG/L)

ANALYTE	N_B	N_S	ND_B	ND_S	MEAN_B	MEAN_S	STD_B	STD_S	F_CALC	F_TAB	DF	T_CALC	T_1.95	P_T_1	REMARK
ALUMINUM	149	106	8	5	3496.5	20830.0	7758.2	53968.8	32.4	3.8	108	3.283	1.66	0.0007	
ANTIMONY	141	92	87	77	268	351	102	303							NNDT more than 20%
ARSENIC	138	106	99	51	39	46	17	30							NNDT more than 20%
BARIUM	149	107	39	2	1059	3537	682	608.5							NNDT more than 20%
BERYLLIUM	148	100	130	70	23	34	0.6	4.4							NNDT more than 20%
CADMIUM	148	106	119	78	2.5	3.4	1.0	4.2							NNDT more than 20%
CALCIUM	149	107	0	0	55030.2	177129.9	31667.8	172674.0	110.9	3.8	111	7.228	1.66	0.0001	
CESIUM	142	97	107	95	378.2	448.6	195.1	101.5							NNDT more than 20%
CHROMIUM	145	107	75	27	13.5	46.9	60.6	91.2							NNDT more than 20%
COBALT	148	107	124	59	21.9	24.1	7.4	27.7							NNDT more than 20%
COPPER	148	107	39	49	11.4	117.8	11.9	646.9							NNDT more than 20%
IRON	149	106	3	5	3909.1	26939.2	9680.1	75639.4	29.7	3.8	107	3.117	1.66	0.0012	
LEAD	141	107	43	29	3.8	18.5	5.4	39.3							NNDT more than 20%
LITHIUM	149	107	34	8	34.0	85.9	48.5	101.1							NNDT more than 20%
MAGNESIUM	149	107	4	0	10317.4	52059.5	7954.6	56654.4	121.4	3.8	109	7.568	1.66	0.0001	
MANGANESE	149	107	17	6	92.4	697.3	187.2	1204.1	106.2	3.8	110	5.152	1.66	0.0001	
MERCURY	148	107	118	96	0.1	0.2	0.0	0.2							NNDT more than 20%
MOLYBDENUM	150	107	99	78	66.0	61.4	45.3	45.7							NNDT more than 20%
NICKEL	146	107	91	36	18.7	52.5	27.6	118.0							NNDT more than 20%
POTASSIUM	150	107	44	6	1843.2	5797.4	1169.5	6613.6							NNDT more than 20%
SELENIUM	145	106	101	44	8.5	48.9	41.7	104.3							NNDT more than 20%
SILICON	84	66	1	0	16575.3	40453.3	15401.0	55239.6	39.1	3.9	73	3.409	1.67	0.0005	
SILVER	147	104	123	83	4.7	59.7	1.0	342.8							NNDT more than 20%
SODIUM	149	107	2	0	30081.9	110537.7	40019.7	113020.3	79.6	3.8	125	7.053	1.65	0.0001	
STRONTIUM	146	106	16	0	312.9	1492.2	270.9	1742.5	104.7	3.8	109	6.908	1.66	0.0001	
THALLIUM	146	107	111	102	3.9	4.1	1.8	1.6							NNDT more than 20%
TIN	149	106	97	86	70.4	82.0	38.2	44.7							NNDT more than 20%
VANADIUM	149	107	35	28	15.1	57.5	18.6	107.6							NNDT more than 20%
ZINC	149	107	14	18	37.1	219.9	49.8	850.0	15.8	3.8	107	2.222	1.66	0.0142	

TABLE A-14
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
UHSU Groundwater Filtered Metals
(Concentration Unit UG/L)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	248	191	0.77	0.43	1.0000		0.5488		N	1816.5	1	YES	
ANTIMONY	248	189	0.48	0.20	0.0011		0.1747		Y	51.2	8	YES	
ARSENIC	219	191	0.07	0.12	1.0000		0.6269		N	15.0	0	NO	
BARIUM	256	191	0.71	0.97	0.0001		0.0001		Y	176.5	30	YES	
BERYLLIUM	212	191	0.10	0.05	1.0000		0.9994		N	5.0	0	NO	
CADMIUM	240	189	0.22	0.11	0.1935		0.9885		N	5.1	4	YES	
CALCIUM	257	191	1.00	1.00	0.0001	0.0001	0.0001	0.0001	Y	148383.0	50	YES	
CESIUM	211	174	0.21	0.05	1.0000		0.9990		N	1122.4	0	NO	
CHROMIUM	250	189	0.36	0.26	0.0026		0.2697		Y	15.0	15	YES	
COBALT	231	191	0.18	0.14	1.0000		0.9689		N	50.0	0	NO	
COPPER	250	190	0.39	0.29	1.0000		0.7052		N	53.8	4	YES	
IRON	256	188	0.76	0.45	1.0000		0.5773		N	1682.7	6	YES	
LEAD	250	191	0.23	0.04	1.0000		0.9999		N	15.8	0	NO	
LITHIUM	250	191	0.74	0.91	0.0001		0.0001		Y	190.7	25	YES	
MAGNESIUM	254	191	0.94	1.00	0.0001	0.0001	0.0001	0.0001	Y	33721.2	65	YES	
MANGANESE	256	191	0.61	0.65	0.0001	0.0001	0.0012		Y	282.1	42	YES	
MERCURY	206	191	0.10	0.01	1.0000		1.0000		N	0.7	0	NO	
MOLYBDENUM	241	189	0.37	0.21	1.0000		0.3284		N	188.1	0	NO	
NICKEL	236	191	0.33	0.37	0.0034		0.0001		Y	35.4	7	YES	
POTASSIUM	252	191	0.72	0.85	0.4312		0.0001		Y	4683.9	25	YES	
SELENIUM	219	191	0.32	0.59	1.0000	0.0001	0.0001		Y	136.8	29	YES	
SILICON										NO BKGD measurement			
SILVER	236	190	0.29	0.10	1.0000		0.9965		N	2586.6	0	NO	
SODIUM	255	191	0.99	1.00	0.0001	0.0001	0.0001	0.0001	Y	156322.0	47	YES	
STRONTIUM	253	191	0.92	1.00	1.0000	0.0001	0.0001	0.0001	Y	1968.2	31	YES	
THALLIUM	213	191	0.22	0.04	1.0000		0.9961		N	72.1	0	NO	
TIN	236	190	0.43	0.18	1.0000		0.9664		N	1734.3	0	NO	
VANADIUM	249	191	0.65	0.36	1.0000		0.8380		N	40.7	0	NO	
ZINC	256	191	0.79	0.51	0.0327		0.9799		Y	64.8	11	YES	

TABLE A-15
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
UHSU Groundwater Filtered Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit UG/L)

(1) No background measurement

TABLE A-16
ROCKY FLATS PLANT OU-6
Background Comparison t Test Results of
UHSU Groundwater Filtered Metals
(Concentration Unit UG/L)

ANALYTE	N_B	N_S	ND_B	ND_S	MEAN_B	MEAN_S	STD_B	STD_S	F_CALC	TAB_DF	T_CALC	T_1.95	P_T_1	REMARK
ALUMINUM	248	191	56	109	113.0	94.3	597.3	347.2						NNDT more than 20%
ANTIMONY	248	189	128	151	24.5	28.1	9.4	19.1						NNDT more than 20%
ARSENIC	219	191	203	168	4.4	3.9	1.6	1.7						NNDT more than 20%
BARIUM	256	191	73	6	87.4	120.0	31.2	63.6						NNDT more than 20%
BERYLLIUM	212	191	190	181	2.3	2.1	0.6	0.8						NNDT more than 20%
CADMIUM	240	189	187	169	2.6	2.4	0.9	1.3						NNDT more than 20%
CALCIUM	257	191	1	0	55208.7	161556.0	32667.6	157987.7	132.0	3.8	202	9.159	1.65 0.0001	NNDT more than 20%
CESIUM	211	174	167	166	443.8	407.9	237.9	159.6						NNDT more than 20%
CHROMIUM	250	189	160	139	6.0	6.7	3.1	6.7						NNDT more than 20%
COBALT	231	191	189	164	20.9	17.7	8.4	10.2						NNDT more than 20%
COPPER	250	190	152	134	10.7	10.9	15.1	10.6						NNDT more than 20%
IRON	256	188	62	103	93.7	193.0	557.1	597.9						NNDT more than 20%
LEAD	250	191	192	184	2.4	1.4	4.7	0.5						NNDT more than 20%
LITHIUM	250	191	64	18	38.0	75.2	53.6	107.2						NNDT more than 20%
MAGNESIUM	254	191	15	0	9991.4	47941.6	8319.8	56083.1	162.3	3.8	196	9.275	1.65 0.0001	NNDT more than 20%
MANGANESE	256	191	101	66	32.7	344.5	87.4	892.1						NNDT more than 20%
MERCURY	206	191	186	190	0.1	0.1	0.1	0.0						NNDT more than 20%
MOLYBDENUM	241	189	151	149	56.1	60.5	46.3	46.1						NNDT more than 20%
NICKEL	236	191	159	120	15.4	21.5	7.0	38.1						NNDT more than 20%
POTASSIUM	252	191	70	28	1574.3	2608.0	1090.3	1666.3						NNDT more than 20%
SELENIUM	219	191	149	79	9.2	46.2	44.8	96.0						NNDT more than 20%
SILICON	0	122	0	0		7186.0		1896.1						NNDT more than 20%
SILVER	236	190	168	171	62.5	4.4	885.0	1.4						NNDT more than 20%
SODIUM	255	191	3	0	31887.5	117400.0	43627.7	127532.2	99.9	3.8	223	8.885	1.65 0.0001	NNDT more than 20%
STRONTIUM	253	191	21	0	353.8	1407.5	566.0	1718.7	116.6	3.8	221	8.146	1.65 0.0001	NNDT more than 20%
THALLIUM	213	191	166	184	5.9	4.0	23.2	1.7						NNDT more than 20%
TIN	236	190	135	156	102.3	70.8	572.2	39.9						NNDT more than 20%
VANADIUM	249	191	88	122	11.8	13.8	10.1	10.4						NNDT more than 20%
ZINC	256	191	54	93	14.4	18.2	17.7	37.8						NNDT more than 20%

TABLE A-17
ROCKY FLATS PLANT OU-6
Background Comparison Summary of
UHSU Groundwater Total Radionuclides
(Concentration Unit pCi/L)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFCT	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	183	131	1 00	1 00	0 0020	0 0018	0 0151		Y	0 037	16	YES	
CESIUM-137	156	68	1 00	1 00	0 0912	0 3756	0 1002		N	1 065	2	YES	
GROSS ALPHA	23	7	1 00	1 00	1 0000	0 1201	0 0775		N	390 578	0	NO	
GROSS BETA	23	7	1 00	1 00	1 0000	0 1201	0 1056		N	221 307	0	NO	
PLUTONIUM-239 240	194	138	1 00	1 00	0 0003	0 0001	0 0001		Y	0 064	12	YES	
RADIUM-226	6	6	1 00	1 00	0 0303	0 0909	0 0547		Y	1 295	1	YES	
RADIUM-228	0	3	0 00	0 00									NO BKGD measurement
STRONTIUM-89,90(1)	32	3	1 00	1 00	0 0857	0 0952	0 0259		Y	1 154	1	YES	
TRITIUM	84	238	1 00	1 00	1 0000	0 3271	0 1193		N	12982 300	0	NO	
URANIUM TOTAL	0	0	0 00	0 00									NO measurements
URANIUM-233 234(1)	35	4	1 00	1 00	1 0000	1 0000	0 3730		N	144 836	0	NO	
URANIUM-235(1)	35	4	1 00	1 00	1 0000	1 0000	0 7981		N	5 233	0	NO	
URANIUM-238(1)	22	4	1 00	1 00	1 0000	0 6759	0 1776		N	114 171	0	NO	

(1) Sample size is too small

TABLE A-18
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
UHSU Groundwater Total Radionuclides
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/L)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AMERICIUM 241	183	131	0	0	0	100	100	100	100	0.006	0.050	0.011	0.297	0.037	16	0.097	3.200	7	0.0020	63	37	0.0018	2.166	1.645	0.0151																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CESIUM 137	156	68	0	0	0	100	100	100	100	0.120	0.231	0.331	0.628	1.065	2	1.160	4.499	2	0.0912	45	15	0.3756	1.280	1.645	0.1002																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GROSS ALPHA	23	7	0	0	0	100	100	100	100	43.497	64.329	94.285	99.739	390.578	0	362.000	280.000	0	1.0000	6	3	0.1201	1.422	1.645	0.0775																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GROSS BETA	23	7	0	0	0	100	100	100	100	24.945	40.003	53.342	55.787	221.307	0	220.000	160.000	0	1.0000	6	3	0.1201	1.251	1.645	0.1056																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
PLUTONIUM 239 240	194	138	0	0	0	100	100	100	100	0.004	0.081	0.021	0.388	0.064	12	0.224	3.650	9	0.0003	67	44	0.0001	5.104	1.645	0.0001																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
RADIUM 226	6	6	0	0	0	100	100	100	100	0.355	2.070	0.128	3.319	1.295	1	0.520	8.800	4	0.0303	3	3	0.0909	1.601	1.645	0.0547																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
RADIUM 228(1)	0	3	0	0	0	100	100	100	100	0.215	0.837	0.276	0.563	1.154	1	1.120	1.220	1	0.0857	7	2	0.0952	1.945	1.645	0.0259																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
STRONTIUM 89 90	32	3	0	0	0	100	100	100	100	624.852	216.280	4246.750	260.340	12982.300	0	39030.000	1088.650	0	1.0000	65	50	0.3271	1.179	1.645	0.1193																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
TRITIUM	84	238	0	0	0	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(1) No detect record from site

(2) No background measurement

TABLE A-19
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
UHSU Groundwater Filtered Radionuclides
 (Concentration Unit pCi/L)

ANALYTE	N	B	N	S	DTF_B	DTF_S	P	SLIP	P	QUAN	P	GEHAN	P	T	1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	2	4	1	00	1	00	1	00	0	4000	0	3217				N	10 068	0	NO(1)	
CESIUM-137	38	12	1	00	1	00	1	00	1	0000	0	6161				N	2 143	0	NO	
GROSS ALPHA	213	167	1	00	1	00	1	00	1	0000	0	0001				Y	100 522	0	YES	
GROSS BETA	196	177	1	00	1	00	1	00	1	0000	0	0001				Y	39 774	4	YES	
PLUTONIUM-239,240	1	4	1	00	1	00	1	00	0	8000	0	7602				N	0 011	1	YES(1)	
RADIUM-226	36	85	1	00	1	00	1	00	0	0001	0	0001				Y	0 626	18	YES	
RADIUM-228	6	18	1	00	1	00	1	00	0	5543	0	8609				N	5 935	1	NO	Not a PCOC by PJ
STRONTIUM-89 90	180	128	1	00	1	00	1	00	0	4156	0	0004				Y	1 210	4	YES	
TRITIUM	165	0	0	00	0	00	0	00												NO site measurement
URANIUM,TOTAL	0	0	0	00	0	00	0	00												NO measurements
URANIUM-233 234	207	172	1	00	1	00	1	00	1	0000	0	0001				Y	79 470	0	YES	
URANIUM-235	207	172	1	00	1	00	1	00	1	0000	0	0001				Y	2 006	2	YES	
URANIUM-238	177	172	1	00	1	00	1	00	1	0000	0	0001				Y	55 240	0	YES	

(1) Sample size is too small

(2) Professional judgment based on log-normal UTL comparison

TABLE A-20

ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
UHSU Groundwater Filtered Radionuclides
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/L)

ANALYTE	N_B	N_S	ND_B	ND_S	DTF_B	DTF_S	MEAN_B	MEAN_S	STD_B	STD_S	UTL99	NGUTL	MAX_B	MAX_S	NGM	P_SLP	N_T20	N_SITE	P_QUAN	Z_CAL	Z_95	P_VAL
AMERICIUM 241	2	4	0	0	1.00	1.00	0.011	0.129	0.011	0.228	10.068	0	0.019	0.471	2	0.4000	2	2	0.4000	0.463	1.645	0.3217
CESIUM 137	38	12	0	0	1.00	1.00	0.420	0.348	0.525	0.389	2.143	0	2.600	1.160	0	1.0000	10	2	0.7636	0.295	1.645	0.6161
GROSS ALPHA	213	167	0	0	1.00	1.00	8.354	16.928	32.315	17.208	100.522	0	312.700	74.490	0	1.0000	76	62	0.0001	9.523	1.645	0.0001
GROSS BETA	196	177	0	0	1.00	1.00	4.892	10.299	12.230	10.858	39.774	4	135.900	90.000	0	1.0000	75	62	0.0001	8.790	1.645	0.0001
PLUTONIUM 239 240	1	4	0	0	1.00	1.00	0.011	0.035		0.067	0.011	1	0.011	0.136	1	0.8000	1	1	0.8000	0.707	1.645	0.7602
RADIUM 226	36	85	0	0	1.00	1.00	0.258	0.475	0.111	0.225	0.626	18	0.530	1.199	29	0.0001	25	25	0.0001	5.355	1.645	0.0001
RADIUM 228	6	18	0	0	1.00	1.00	2.122	1.614	0.520	1.888	5.935	1	3.000	7.700	2	0.5543	6	4	0.8609	1.901	1.645	0.9713
STRONTIUM 89 90	180	128	0	0	1.00	1.00	0.338	0.449	0.306	0.359	1.210	4	1.800	1.804	1	0.4156	62	38	0.0004	3.196	1.645	0.0007
TRITIUM(1)	165	0	0	0																		
URANIUM TOTAL(2)	0	0	0	0																		
URANIUM-233 234	207	172	0	0	1.00	1.00	6.914	12.997	25.439	13.602	79.470	0	199.500	63.000	0	1.0000	76	61	0.0001	9.997	1.645	0.0001
URANIUM 235	207	172	0	0	1.00	1.00	0.195	0.438	0.635	0.491	2.006	2	4.803	2.100	0	1.0000	76	60	0.0001	8.501	1.645	0.0001
URANIUM 238	177	172	0	0	1.00	1.00	4.832	9.395	17.673	9.620	55.240	0	135.600	39.000	0	1.0000	70	61	0.0001	9.916	1.645	0.0001

(1) No site measurement

(2) No background measurement

TABLE A-21
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Pond Sediments Metals
(Concentration Unit MG/KG)

ANALYTE	N	B	N	S	DTF_B	DTF_S	P	SLIP	P_QUAN	P_GEHAN	P_T	I	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	20	57			1.00	1.00	0.4000	0.3476	0.1135	0.2025	N			29553.4	0	NO	
ANTIMONY	18	28			0.44	0.39	0.6087		0.3327		N			55.0	1	YES	
ARSENIC	20	57			0.90	1.00	1.0000		0.5749	0.9802	N			66.7	0	NO	
BARUM	20	57			1.00	1.00	1.0000	0.9300	0.5577	0.8872	N			794.9	0	NO	
BERYLLIUM	16	57			0.81	0.98	0.3629		0.1331		N			5.6	4	NO	Not a PCOC by PJ (1)
CADMIUM	16	56			0.88	0.39	0.6025		0.9911		N			8.8	1	NO	Not a PCOC by PJ (1)
CALCIUM	20	57			1.00	1.00	0.7403	0.9300	0.4400	0.7545	N			80941.3	0	NO	
CESIUM	17	57			1.00	0.93	1.0000		1.0000		N			1259.1	0	NO	
CHROMIUM	18	57			1.00	1.00	0.0377	0.0704	0.0172		Y			31.2	6	YES	
COBALT	19	57			0.95	1.00	1.0000	0.8358	0.0340	0.3018	Y			35.1	0	YES	
COPPER	19	57			1.00	1.00	1.0000	0.6377	0.0047	0.3555	Y			174.7	0	YES	
IRON	19	57			1.00	1.00	1.0000	0.9440	0.0235	0.8936	Y			143862.0	0	YES	
LEAD	19	57			1.00	1.00	1.0000	0.9859	0.7115	0.8849	N			261.1	0	NO	
LITHIUM	18	57			1.00	0.98	1.0000		0.9875		N			106.7	0	NO	
MAGNESIUM	20	57			1.00	1.00	0.0785	0.0365	0.0001	0.0001	Y			6328.5	0	YES	
MANGANESE	20	57			0.70	1.00	1.0000	0.9300	0.0238		Y			1993.1	0	YES	
MERCURY	15	56			1.00	0.43	0.7887	0.9467	0.9994		N			1.7	0	NO	NO site measurement
MOLYBDENUM																	
NICKEL	17	56			1.00	0.70	0.7671	0.5169	0.1637		N			44.3	1	NO	Not a PCOC by PJ (1)
POTASSIUM	18	56			1.00	0.89	0.0496	0.0662	0.0008		Y			3872.2	0	YES	
SELENIUM	19	57			0.89	0.05	1.0000		1.0000		N			5.3	0	NO	
SILICON																	
SILVER	15	57			0.87	0.39	0.0054	0.0191	0.3114		Y			11.5	19	YES	
SODIUM	20	57			0.85	1.00	1.0000	0.5983	0.0119	0.5326	Y			2610.3	0	YES	
STRONTIUM	20	57			1.00	1.00	1.0000	0.9962	0.8340	0.9479	N			621.7	0	NO	
THALLIUM	13	56			0.69	0.39	1.0000		1.0000		N			13.6	0	NO	
TIN	19	56			0.95	0.02	1.0000		0.9953		N			103.3	0	NO	
VANADIUM	19	57			1.00	1.00	0.7500	0.6377	0.0028	0.0762	Y			83.0	0	YES	
ZINC	20	57			1.00	1.00	0.0001	0.0042	0.0001	0.0001	Y			143.0	19	YES	

(1) Professional judgment based on log-normal UTL comparison

TABLE A-22
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Sediment Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit MG/KG)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
ALUMINUM	20	57	0	0	0	100	0	100	0	100	0	100	10354.3	11428.5	5010.7	4909.6	29553.4	0	21600.0	27400.0	3	0.4000	16	13	0.3476	1.208	1.645	0.1135													
ANTIMONY	18	28	10	17	0	0.44	0.39	12.6	16.1	107	151	55.0	1	60.0	68.5	1	0.6087	999	999	0.0000	0.432	1.645	0.3327																		
ARSENIC	20	57	2	0	0	0.90	1.00	12.9	6.0	14.0	16	66.7	0	49.2	10.2	0	1.0000	999	999	0.0000	-0.189	1.645	0.5749																		
BARIUM	20	57	0	0	0	1.00	1.00	207.9	164.7	153.2	31.7	794.9	0	706.0	254.0	0	1.0000	16	10	0.9300	-0.145	1.645	0.5577																		
BERYLLIUM	16	57	3	1	0.81	0.98	1.4	1.8	1.0	2.5	5.6	4	5.0	15.2	4	0.3629	999	999	0.0000	1.112	1.645	0.1331																			
CADMIUM	16	56	2	34	0.88	0.39	2.3	1.7	1.6	2.0	8.8	1	6.1	9.9	2	0.6025	999	999	0.0000	2.371	1.645	0.9911																			
CALCIUM	20	57	0	0	0	1.00	1.00	19407.5	16698.9	16059.6	11030.5	80941.3	0	61000.0	68100.0	1	0.7403	16	10	0.9300	0.151	1.645	0.4400																		
CESIUM	17	57	0	4	1.00	0.93	341.6	9.6	227.3	251	1259.1	0	725.0	5.8	0	1.0000	999	999	0.0000	-6.426	1.645	1.0000																			
CHROMIUM	18	57	0	0	0	1.00	1.00	11.2	17.8	5.0	15.3	31.2	6	22.5	96.1	11	0.0377	15	14	0.0704	2.115	1.645	0.0172																		
COBALT	19	57	1	0	0	0.95	1.00	9.5	10.3	6.6	1.8	35.1	0	27.3	15.5	0	1.0000	16	11	0.8358	1.825	1.645	0.0340																		
COPPER	19	57	0	0	0	1.00	1.00	27.5	30.1	37.8	21.5	174.7	0	178.0	125.0	0	1.0000	16	12	0.6377	2.597	1.645	0.0047																		
IRON	19	57	0	0	0	1.00	1.00	25565.8	16540.2	30391.4	3541.4	143861.5	0	112000.0	26500.0	0	1.0000	16	10	0.9440	1.985	1.645	0.0235																		
LEAD	19	57	0	0	0	1.00	1.00	47.9	36.4	54.8	27.0	261.1	0	255.0	155.0	0	1.0000	16	9	0.9859	-0.558	1.645	0.7115																		
LITHIUM	18	57	0	1	1.00	0.98	21.6	8.3	21.5	3.1	106.7	0	70.2	16.6	0	1.0000	999	999	0.0000	2.240	1.645	0.9875																			
MAGNESIUM	20	57	0	0	0	1.00	1.00	2446.8	3536.0	1013.1	846.5	6328.5	0	4730.0	5650.0	8	0.0785	16	15	0.0365	4.235	1.645	0.0001																		
MANGANESE	20	57	6	0	0	0.70	1.00	318.0	283.2	437.2	85.6	1993.1	0	1740.0	558.0	0	1.0000	16	10	0.9300	1.981	1.645	0.0238																		
MERCURY	15	56	0	32	1.00	0.43	0.3	0.2	0.3	0.3	0.3	1.7	0	1.3	1.5	1	0.7887	15	10	0.9467	3.261	1.645	0.9994																		
MOLYBDENUM(1)																																									
NICKEL	17	56	0	17	1.00	0.70	13.9	15.4	7.5	10.0	44.3	1	29.9	58.1	1	0.7671	15	12	0.5169	0.979	1.645	0.1637																			
POTASSIUM	18	56	0	6	1.00	0.89	1299.8	1924.1	649.5	784.6	3872.2	0	2730.0	3540.0	10	0.0496	15	14	0.0662	3.175	1.645	0.0008																			
SELENIUM	19	57	2	54	0.89	0.05	1.5	0.5	1.0	0.2	5.3	0	3.5	1.9	0	1.0000	999	999	0.0000	5.405	1.645	1.0000																			
SILICON(1)																																									
SILVER	15	57	2	35	0.87	0.39	2.7	39.6	2.1	80.9	11.5	19	6.8	345.0	19	0.0054	15	15	0.0191	0.492	1.645	0.3114																			
SODIUM	20	57	3	0	0.85	1.00	370.6	359.7	584.5	157.9	2610.3	0	2730.0	761.0	0	1.0000	16	12	0.5983	2.260	1.645	0.0119																			
STRONTIUM	20	57	0	0	1.00	1.00	129.7	80.0	128.4	41.1	621.7	0	546.0	307.0	0	1.0000	16	8	0.9962	-0.970	1.645	0.8340																			
THALLIUM	13	56	4	34	0.69	0.39	2.0	0.8	2.6	0.2	13.6	0	9.2	0.9	0	1.0000	999	999	0.0000	-4.156	1.645	1.0000																			
TIN	19	56	1	55	0.95	0.02	27.6	20.3	19.4	2.6	103.3	0	70.2	39.5	0	1.0000	999	999	0.0000	2.599	1.645	0.9953																			
VANADIUM	19	57	0	0	1.00	1.00	27.6	32.8	14.2	9.5	83.0	0	61.2	62.7	1	0.7500	16	12	0.6377	2.765	1.645	0.0028																			
ZINC	20	57	0	0	1.00	1.00	56.1	165.8	22.7	181.1	143.0	19	112.0	1270.0	30	0.0001	16	16	0.0042	5.321	1.645	0.0001																			

(1) No site measurement

TABLE A-23
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Pond Sediment Radionuclides
(Concentration Unit pCi/G)

ANALYTE	N	B	N	S	DTF	B	DTF	S	P	SLIP	P	QUAN	P	GEHAN	P	T	1	SIGNIFIC	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	14	48	1.00	1.00	1.00	0.0005	0.0232	0.0001	Y	1.472	22	YES										
CESIUM-137	13	46	1.00	1.00	1.00	1.0000	0.9833	0.9966	N	3.510	0	NO										
GROSS ALPHA	15	55	1.00	1.00	1.00	0.0062	0.0225	0.0016	Y	78.829	9	YES										
GROSS BETA	14	56	1.00	1.00	1.00	0.0688	0.4299	0.0006	Y	45.966	3	YES										
PLUTONIUM-239 240	16	47	1.00	1.00	1.00	0.0018	0.0134	0.0001	Y	7.678	17	YES										
RADIUM-226	9	5	1.00	1.00	1.00	0.0005	0.0050	0.0013	Y	1.973	0	YES										
RADIUM-228	9	5	1.00	1.00	1.00	0.0005	0.0275	0.0013	Y	2.884	0	YES										
STRONTIUM-89 90	14	25	1.00	1.00	1.00	0.6410	0.7033	0.0188	Y	2.649	0	YES										
TRITIUM (1)	13	41	1.00	1.00	1.00	0.4298	0.1853	0.7110	N	769.750	2	NO	Not a PCOC by PJ (2)									
URANIUM TOTAL	0	0	0.00	0.00	0.00																	NO HIT
URANIUM-233 234	16	50	1.00	1.00	1.00	0.0001	0.0121	0.0001	Y	2.389	8	YES										
URANIUM-235	17	50	1.00	1.00	1.00	0.2194	0.0712	0.0015	Y	0.248	5	YES										
URANIUM-238	14	50	1.00	1.00	1.00	0.0016	0.0270	0.0001	Y	2.540	8	YES										

(1) Concentration Unit pCi/L

(2) Professional judgment based on log-normal UTL comparison

TABLE A-24
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Sediment Radionuclides
(Shippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/G)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
AMERICIUM 241	14	55	0	0	0	0	0	0	1.00	1.00	1.00	0.127	23.184	0.307	63.598	1.472	29	1.072	389.400	30	0.0001	14	14	0.0282	4.864	1.645	0.0001														
CESIUM 137	13	57	0	0	0	0	0	0	1.00	1.00	1.00	0.812	0.447	0.603	0.512	3.510	0	2.300	2.810	1	0.8143	14	9	0.9827	2.651	1.645	0.9960														
GROSS ALPHA	15	57	0	0	0	0	0	0	1.00	1.00	1.00	19.709	106.743	14.002	261.135	78.829	10	47.600	1735.000	19	0.0054	15	15	0.0191	3.030	1.645	0.0012														
GROSS BETA	14	57	0	0	0	0	0	0	1.00	1.00	1.00	23.728	31.807	5.080	12.186	45.966	4	32.500	98.170	12	0.0552	15	13	0.3854	3.281	1.645	0.0005														
PLUTONIUM 239 240	16	50	0	0	0	0	0	0	1.00	1.00	1.00	0.613	16.252	1.713	32.798	7.678	19	6.667	180.200	20	0.0012	14	14	0.0121	4.893	1.645	0.0001														
RADIUM 226	9	9	0	0	0	0	0	0	1.00	1.00	1.00	0.705	0.879	0.235	0.086	1.973	0	1.100	1.016	0	1.0000	4	3	0.2882	2.253	1.645	0.0121														
RADIUM 228	9	9	0	0	0	0	0	0	1.00	1.00	1.00	1.179	1.622	0.316	0.147	2.884	0	1.600	1.835	5	0.0147	4	4	0.0412	2.693	1.645	0.0035														
STRONTIUM 89 90	14	25	0	0	0	0	0	0	1.00	1.00	1.00	0.353	0.446	0.525	0.441	2.649	0	1.727	1.800	1	0.6410	8	5	0.7033	2.079	1.645	0.0188														
TRITIUM	13	50	0	0	0	0	0	0	1.00	1.00	1.00	198.538	220.083	127.731	325.297	769.750	3	540.000	1729.000	5	0.3014	13	12	0.1847	-0.764	1.645	0.7777														
URANIUM TOTAL(1)	0	0	0	0	0	0	0	0																																	
URANIUM 233 234	16	56	0	0	0	0	0	0	1.00	1.00	1.00	0.822	3.232	0.380	4.618	2.389	13	1.427	25.220	34	0.0001	15	15	0.0141	4.727	1.645	0.0001														
URANIUM 235	17	56	0	0	0	0	0	0	1.00	1.00	1.00	0.039	0.153	0.052	0.250	0.248	10	0.212	1.302	10	0.0573	15	14	0.0790	3.328	1.645	0.0004														
URANIUM 238	14	56	0	0	0	0	0	0	1.00	1.00	1.00	0.733	4.331	0.413	7.736	2.540	13	1.610	43.090	27	0.0004	14	14	0.0300	5.066	1.645	0.0001														

(1) No Background measurement

TABLE A-25
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Pond Surface Water Total Metals
(Concentration Unit UG/L)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFCT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	44	49	0.91	0.98	1.0000	1.0000	1.0000	0.9937	N	176057.0	0	NO	
ANTIMONY	30	51	0.37	0.06	1.0000		0.9952		N	448.7	0	NO	
ARSENIC	40	51	0.65	0.41	1.0000		0.9996		N	727.5	0	NO	
BARIUM	40	51	0.83	1.00	1.0000	1.0000	1.0000	0.9992	N	6697.9	0	NO	
BERYLLIUM	34	51	0.38	0.04	1.0000		0.9983		N	14.6	0	NO	
CADMIUM	29	51	0.34	0.22	1.0000		1.0000		N	73.2	0	NO	
CALCIUM	48	51	1.00	1.00	1.0000	1.0000	1.0000	0.9997	N	521669.0	0	NO	
CESIUM	29	51	0.28	0.12	1.0000		0.9735		N	1942.1	0	NO	
CHROMIUM	36	51	0.44	0.16	1.0000		1.0000		N	196.6	0	NO	
COBALT	31	51	0.39	0.35	1.0000		0.9999		N	375.2	0	NO	
COPPER	40	47	0.58	0.19	1.0000		1.0000		N	385.9	0	NO	
IRON	46	51	0.98	1.00	1.0000	1.0000	1.0000	0.9900	N	1915387.0	0	NO	
LEAD	41	50	0.71	0.78	1.0000	1.0000	0.9995		N	796.4	0	NO	
LITHIUM	31	51	0.55	1.00	1.0000		0.8200		N	125.0	0	NO	
MAGNESIUM	46	51	0.87	1.00	1.0000	0.0657	0.0655	0.0188	Y	35266.9	0	YES	
MANGANESE	47	51	0.87	1.00	1.0000	0.9756	0.3282	0.9898	N	18404.9	0	NO	
MERCURY	29	51	0.21	0.33	1.0000	0.5002	0.3482		N	1.1	0	NO	
MOLYBDENUM	29	51	0.31	0.75	1.0000		0.9538		N	197.2	0	NO	
NICKEL	31	51	0.42	0.47	1.0000		1.0000		N	476.0	0	NO	
POTASSIUM	37	51	0.54	1.00	1.0000	0.0478	0.0002		Y	13719.0	0	YES	
SELENIUM	32	49	0.38	0.22	1.0000		0.9575		N	16.6	0	NO	
SILICON	11	51	1.00	1.00	1.0000	1.0000	1.0000		N	23029.6	0	NO	
SILVER	28	47	0.36	0.06	1.0000		0.9996		N	107.1	0	NO	
SODIUM	48	51	0.98	1.00	0.0001	0.0001	0.0001	0.0001	Y	27145.6	30	YES	
STRONTIUM	37	51	0.70	1.00	1.0000		0.9900		N	2167.9	0	NO	NO HIT
THALLIUM	35	51	0.11	0.00									
TIN	31	51	0.42	0.20	1.0000		0.9996		N	794.7	0	NO	
VANADIUM	37	51	0.57	0.49	1.0000		1.0000		N	1096.5	0	NO	
ZINC	46	51	0.89	0.76	1.0000	1.0000	1.0000		N	1625.9	0	NO	

TABLE A-26
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Surface Water Total Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit UG/L)

(1) No detect record from site

TABLE A-27
ROCKY FLATS PLANT, OU-6
Background Comparison t Test Results of
Pond Surface Water Total Metals
(Concentration Unit UG/L)

ANALYTE	N	B	N	S	ND	B	ND	S	MEAN	B	MEAN	S	STD	B	STD	S	F	CAL	F	TAB	DF	T	CAL	T	1	95	P	T	1	REMARK
ALUMINUM	44	49	4	1	19493	4	2592	49035	1	219	6	187	39	43	-2	602	1	68	0	9937	NNDT more than 20%									
ANTIMONY	30	51	19	48	525	294	114	9	26	NNDT more than 20%																				
ARSENIC	40	51	14	30	763	47	200	5	08	NNDT more than 20%																				
BARIUM	40	51	7	0	9937	475	1755	9	27	1	52	5	40	39	-3	408	1	69	0	9992	NNDT more than 20%									
BERYLLIUM	34	51	21	49	32	24	34	0	4	NNDT more than 20%																				
CADMIUM	29	51	19	40	102	23	181	0	3	NNDT more than 20%																				
CALCIUM	48	51	0	0	101452	1	31122	5	14175	5	22	2	39	48	-3	638	1	68	0	9997	NNDT more than 20%									
CESIUM	29	51	21	45	4459	4473	430	8	145	9	NNDT more than 20%																			
CHROMIUM	36	51	20	43	261	47	51	4	06	NNDT more than 20%																				
COBALT	31	51	19	33	495	169	95	2	11	0	NNDT more than 20%																			
COPPER	40	47	17	38	479	107	104	0	37	NNDT more than 20%																				
IRON	46	51	1	0	193560	4	3033	543454	4	250	3	22	7	39	45	-2	412	1	68	0	9900	NNDT more than 20%								
LEAD	41	50	12	11	995	35	215	5	25	NNDT more than 20%																				
LITHIUM	31	51	14	0	352	191	262	15	5	NNDT more than 20%																				
MAGNESIUM	46	51	6	0	109430	1	14360	1	76772	8272	6	60	39	95	2	110	1	66	0	0188	NNDT more than 20%									
MANGANESE	47	51	6	0	19406	1120	5215	5	84	5	23	2	39	46	-2	403	1	68	0	9898	NNDT more than 20%									
MERCURY	29	51	23	34	02	02	03	0	2	NNDT more than 20%																				
MOLYBDENUM	29	51	20	13	416	294	448	41	8	NNDT more than 20%																				
NICKEL	31	51	18	27	570	124	122	5	8	2	NNDT more than 20%																			
POTASSIUM	37	51	17	0	37649	6120	2	30187	2804	2	NNDT more than 20%																			
SELENIUM	32	49	20	38	37	29	38	1	0	NNDT more than 20%																				
SILICON	11	51	0	0	84082	2897	6	30278	1934	0	NNDT more than 20%																			
SILVER	28	47	18	44	115	48	273	0	6	NNDT more than 20%																				
SODIUM	48	51	1	0	125650	61372	5	46223	53891	2	60	4	39	51	6	443	1	68	0	0001	NNDT more than 20%									
STRONTIUM	37	51	11	0	5312	2393	496	3	81	5	NNDT more than 20%																			
THALLIUM	35	51	31	51	40	50	17	0	0	NNDT more than 20%																				
TIN	31	51	18	41	1089	821	200	4	36	6	NNDT more than 20%																			
VANADIUM	37	51	16	26	1289	146	293	4	10	8	NNDT more than 20%																			
ZINC	46	51	5	12	2094	156	447	1	12	2	NNDT more than 20%																			

TABLE A-28
ROCKY FLATS PLANT, OU-6
OU-6 Background Comparison Summary of
Pond Surface Water Filtered Metals
(Concentration Unit UG/L)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFCT	UTL99	NGUTL_	PCOC	REMARK
ALUMINUM	42	48	0.26	0.67	1.0000		0.6986		N	185.1	0	NO	
ANTIMONY	29	51	0.31	0.18	1.0000		0.9963		N	123.9	0	NO	
ARSENIC	34	51	0.18	0.37	1.0000		0.1529		N	18.0	0	NO	
BARIUM	46	51	0.43	1.00	1.0000		1.0000		N	188.6	0	NO	
BERYLLIUM	21	51	0.00	0.06	1.0000		0.5000		N	5.0	0	NO	
CADMIUM	26	51	0.00	0.10	1.0000		0.5000		N	5.0	0	NO	
CALCIUM	49	51	1.00	1.00	1.0000	1.0000	1.0000	0.9997	N	159463.0	0	NO	
CESIUM	30	51	0.13	0.18	1.0000		0.9959		N	2500.0	0	NO	
CHROMIUM	27	51	0.07	0.08	1.0000		0.8954		N	14.8	0	NO	
COBALT	30	51	0.07	0.33	1.0000		0.8347		N	50.0	0	NO	
COPPER	40	44	0.25	0.02	1.0000		0.8546		N	26.0	0	NO	
IRON	48	50	0.71	0.96	1.0000	1.0000	1.0000		N	14947.5	0	NO	
LEAD	41	50	0.22	0.46	0.5495		0.0143		Y	4.7	2	YES	
LITHIUM	42	51	0.33	1.00	1.0000		0.3195		N	96.2	0	NO	
MAGNESIUM	46	51	0.74	1.00	0.0721	0.0001	0.0001		Y	23399.8	14	YES	
MANGANESE	43	51	0.88	1.00	1.0000	0.9968	0.6805	0.9943	N	728.6	0	NO	
MERCURY	22	51	0.27	0.22	1.0000		0.9575		N	4.4	0	NO	
MOLYBDENUM	33	51	0.21	0.69	1.0000		0.8586		N	213.8	0	NO	
NICKEL	23	51	0.13	0.53	1.0000		0.9178		N	40.0	0	NO	
POTASSIUM	38	51	0.42	1.00	0.0001	0.0001	0.0001		Y	6911.4	28	YES	
SELENIUM	27	48	0.19	0.15	1.0000		0.8495		N	19.0	0	NO	NO BKGD measurement
SILICON	0	51		1.00									
SILVER	31	50	0.16	0.02	1.0000		0.8868		N	12.5	0	NO	
SODIUM	49	51	1.00	1.00	0.0001	0.0001	0.0001	0.0001	Y	29793.3	28	YES	
STRONTIUM	44	51	0.80	1.00	1.0000	1.0000	0.9745		N	1763.4	0	NO	
THALLIUM	26	51	0.04	0.00									NO HIT
TIN	35	51	0.17	0.16	1.0000		0.9964		N	200.0	0	NO	
VANADIUM	37	51	0.16	0.45	1.0000		0.9821		N	50.0	0	NO	
ZINC	45	51	0.47	0.55	1.0000		0.8665		N	82.9	0	NO	

TABLE A-29
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Surface Water Filtered Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit UG/L)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
ALUMINUM	42	48	31	16	16	0.26	0.67	77.5	53.9	33.4	38.0	185.1	0	200.0	154.0	0	1.000	999	999	0000	-0.520	1.645	0.6986																		
ANTIMONY	29	51	20	42	0.31	0.18	35.5	27.8	25.5	4.7	123.9	0	104.0	20.3	0	1.000	999	999	0000	2.675	1.645	0.9963																			
ARSENIC	34	51	28	32	0.18	0.37	4.7	4.8	2.8	0.9	18.0	0	18.0	7.4	0	1.000	999	999	0000	1.024	1.645	0.1529																			
BARIUM	46	51	26	0	0.43	1.00	97.7	43.9	28.7	25.4	188.6	0	211.0	125.0	0	1.000	999	999	0000	-4.148	1.645	1.0000																			
BERYLLIUM	21	51	21	48	0.00	0.06	2.3	2.4	0.6	0.5	5.0	0	5.0	0.3	0	1.000	999	999	0000	0.000	1.645	0.5000																			
CADMIUM	26	51	26	46	0.00	0.10	2.4	2.4	0.3	0.2	5.0	0	5.0	2.2	0	1.000	999	999	0000	0.000	1.645	0.5000																			
CALCIUM	49	51	0	0	1.00	1.00	50869.4	31813.7	34547.7	14541.1	159463.0	0	216000.0	86600.0	0	1.000	20	3	1.0000	-4.651	1.645	1.0000																			
CESIUM	30	51	26	42	0.13	0.18	750.0	423.7	701.0	166.6	2500.0	0	2500.0	120.0	0	1.000	999	999	0000	2.646	1.645	0.9959																			
CHROMIUM	27	51	25	47	0.07	0.08	5.0	4.9	2.2	0.5	14.8	0	14.8	3.4	0	1.000	999	999	0000	1.256	1.645	0.8954																			
COBALT	30	51	28	34	0.07	0.33	22.3	17.4	7.2	10.9	50.0	0	50.0	4.1	0	1.000	999	999	0000	-0.973	1.645	0.8347																			
COPPER	40	44	30	43	0.25	0.02	11.3	12.3	4.5	1.3	26.0	0	27.8	3.7	0	1.000	999	999	0000	1.056	1.645	0.8546																			
IRON	48	50	14	2	0.71	0.96	1974.3	44.3	4112.7	106.6	14947.5	0	16700.0	765.0	0	1.000	20	1	1.0000	-6.083	1.645	1.0000																			
LEAD	41	50	32	27	0.22	0.46	2.1	2.2	0.8	1.1	4.7	2	5.4	6.5	1	0.550	999	999	0000	2.188	1.645	0.0143																			
LITHIUM	42	51	28	0	0.33	1.00	37.5	19.2	18.2	16.0	96.2	0	100.0	57.3	0	1.000	999	999	0000	0.469	1.645	0.3195																			
MAGNESIUM	46	51	12	0	0.74	1.00	7202.0	14718.8	5112.5	8523.8	23399.8	14	27400.0	29500.0	4	0.072	20	18	0.0001	4.608	1.645	0.0001																			
MANGANESE	43	51	5	0	0.88	1.00	130.8	53.3	186.5	55.8	728.6	0	760.0	262.0	0	1.000	20	6	0.9968	-0.469	1.645	0.6805																			
MERCURY	22	51	16	40	0.27	0.22	0.4	0.1	1.1	0.1	4.4	0	5.1	0.6	0	1.000	999	999	0000	1.723	1.645	0.9575																			
MOLYBDENUM	33	51	26	16	0.21	0.69	77.6	35.3	40.4	44.3	213.8	0	200.0	18.8	0	1.000	999	999	0000	1.074	1.645	0.8586																			
NICKEL	23	51	20	24	0.13	0.53	17.6	12.1	5.0	8.4	40.0	0	40.0	30.3	0	1.000	999	999	0000	1.390	1.645	0.9178																			
POTASSIUM	38	51	22	0	0.42	1.00	2442.4	6289.9	1362.3	2972.7	6911.4	28	7073.0	12000.0	28	0.000	18	18	0.0001	5.797	1.645	0.0001																			
SELENIUM	27	48	22	41	0.19	0.15	3.3	2.7	3.7	0.5	19.0	0	19.0	4.5	0	1.000	999	999	0000	1.034	1.645	0.8495																			
SILICON(1)	0	51	0	0	1.00																																				
SILVER	31	50	26	49	0.16	0.02	4.8	5.0	1.8	0.3	12.5	0	12.5	3.2	0	1.000	999	999	0000	1.210	1.645	0.8868																			
SODIUM	49	51	0	0	1.00	1.00	12466.2	63372.5	5512.4	55702.2	29793.3	28	35200.0	192000.0	27	0.000	20	20	0.0001	8.354	1.645	0.0001																			
STRONTIUM	44	51	9	0	0.80	1.00	494.8	245.1	397.3	83.2	1763.4	0	1000.0	597.0	0	1.000	19	1	1.0000	1.951	1.645	0.9745																			
THALLIUM(2)	26	51	25	51	0.04	0.00																																			
TIN	35	51	29	43	0.17	0.16	81.2	85.5	35.3	33.9	200.0	0	200.0	11.8	0	1.000	999	999	0000	2.690	1.645	0.9964																			
VANADIUM	37	51	31	28	0.16	0.45	20.1	15.3	8.9	10.8	50.0	0	50.0	4.8	0	1.000	999	999	0000	2.099	1.645	0.9821																			
ZINC	45	51	24	23	0.47	0.55	17.4	12.1	20.6	5.9	82.9	0	105.0	29.2	0	1.000	999	999	0000	1.110	1.645	0.8665																			

(1) No background measurement
(2) No detect record from site

TABLE A-30
ROCKY FLATS PLANT, OU-6
Background Comparison t Test Results of
Pond Surface Water Filtered Metals
(Concentration Unit UG/L)

ANALYTE	N_B	N_S	ND_B	ND_S	MEAN_B	MEAN_S	STD_B	STD_S	F_CALC	TAB_DF	T_CALC	T_1_95	P_T_1	REMARK
ALUMINUM	42	48	31	16	77.5	53.9	33.4	38.0						NNDT more than 20%
ANTIMONY	29	51	20	42	35.5	27.8	25.5	4.7						NNDT more than 20%
ARSENIC	34	51	28	32	4.7	4.8	2.8	0.9						NNDT more than 20%
BARIUM	46	51	26	0	97.7	43.9	28.7	25.4						NNDT more than 20%
BERYLLIUM	21	51	21	48	2.3	2.4	0.6	0.5						NNDT more than 20%
CADMIUM	26	51	26	46	2.4	2.4	0.3	0.2						NNDT more than 20%
CALCIUM	49	51	0	0	50869.4	31813.7	34547.7	14541.1	6.4	3.9	64	-3.569	1.67	0.9997
CESIUM	30	51	26	42	750.0	423.7	701.0	166.6						NNDT more than 20%
CHROMIUM	27	51	25	47	5.0	4.9	2.2	0.5						NNDT more than 20%
COBALT	30	51	28	34	22.3	17.4	7.2	10.9						NNDT more than 20%
COPPER	40	44	30	43	11.3	12.3	4.5	1.3						NNDT more than 20%
IRON	48	50	14	2	1974.3	44.3	4112.7	106.6						NNDT more than 20%
LEAD	41	50	32	27	2.1	2.2	0.8	1.1						NNDT more than 20%
LITHIUM	42	51	28	0	37.5	19.2	18.2	16.0						NNDT more than 20%
MAGNESIUM	46	51	12	0	7202.0	14718.8	5112.5	8523.8						NNDT more than 20%
MANGANESE	43	51	5	0	130.8	53.3	186.5	55.8	31.7	3.9	48	-2.629	1.68	0.9943
MERCURY	22	51	16	40	0.4	0.1	1.1	0.1						NNDT more than 20%
MOLYBDENUM	33	51	26	16	77.6	35.3	40.4	44.3						NNDT more than 20%
NICKEL	23	51	20	24	17.6	12.1	5.0	8.4						NNDT more than 20%
POTASSIUM	38	51	22	0	2442.4	6289.9	1362.3	2972.7						NNDT more than 20%
SELENIUM	27	48	22	41	3.3	2.7	3.7	0.5						NNDT more than 20%
SILICON	0	51	0	0		2939.5		1878.5						NO BKG measurement
SILVER	31	50	26	49	4.8	5.0	1.8	0.3						NNDT more than 20%
SODIUM	49	51	0	0	12466.2	63372.5	5512.4	55702.2	60.1	3.9	51	6.494	1.68	0.0001
STRONTIUM	44	51	9	0	494.8	245.1	397.3	83.2						NNDT more than 20%
THALLIUM	26	51	25	51	5.3	5.0	3.2	0.0						NNDT more than 20%
TIN	35	51	29	43	81.2	85.5	35.3	33.9						NNDT more than 20%
VANADIUM	37	51	31	28	20.1	15.3	8.9	10.8						NNDT more than 20%
ZINC	45	51	24	23	17.4	12.1	20.6	5.9						NNDT more than 20%

TABLE A-31
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Pond Surface Water Total Radionuclides
(Concentration Unit pCi/L)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	37	49	1 00	1 00	1 0000	0 5703	0 1674		N	0 080	0	NO	
CESIUM-137	37	18	1 00	1 00	1 0000	1 0000	0 9796		N	7 157	0	NO	
GROSS ALPHA	36	48	1 00	1 00	1 0000	1 0000	0 9284		N	340 129	0	NO	
GROSS BETA	10	51	1 00	1 00	0 0001	0 0725	0 0001		Y	9 742	13	YES	
PLUTONIUM-239,240	33	51	1 00	1 00	1 0000	0 9825	0 9268		N	2 849	0	NO	
RADIUM-226	12	0	0 00	0 00									NO site measurement
RADIUM-228	5	0	0 00	0 00									NO site measurement
STRONTIUM-89 90	32	51	1 00	1 00	0 2267	0 4931	0 1420		N	1 614	0	NO	
TRITIUM	31	46	1 00	1 00	1 0000	0 5178	0 4917		N	4277 820	0	NO	
URANIUM TOTAL	0	0	0 00	0 00									NO measurements
URANIUM-233 234	33	51	1 00	1 00	1 0000	0 0352	0 0001		Y	4 988	0	YES	
URANIUM-235	32	51	1 00	1 00	0 0161	0 0266	0 0032		Y	0 307	4	YES	
URANIUM-238	28	51	1 00	1 00	1 0000	0 0995	0 0008		Y	4 885	0	YES	

TABLE A-32
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Surface Water Total Radionuclides
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/l)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL		
AMERICIUM 241	37	49	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.013	0.010	0.010	0.010	0.020	0.010	0.080	0	0.100	0.038	0	1.0000	0	1.0000	19	11	0.5703	0.964	1.645	0.1674											
CESIUM 137	37	18	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.584	-0.033	1.993	0.295	7.157	0	12.000	0.331	0	1.0000	0	1.0000	12	0	1.0000	2.045	1.645	0.9796													
GROSS ALPHA	36	48	0	0	0	0	0	0	1.00	1.00	1.00	1.00	42.517	3.078	89.767	1.634	340.129	0	440.000	7.879	0	1.0000	0	1.0000	17	2	1.0000	1.464	1.645	0.9284													
GROSS BETA	10	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	2.149	7.715	1.496	3.038	9.742	13	4.300	15.000	44	0.0001	0	1.0000	13	13	0.0725	4.784	1.645	0.0001													
PLUTONIUM 239 240	33	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.214	0.015	0.781	0.019	2.849	0	4.400	0.076	0	1.0000	0	1.0000	17	7	0.9825	1.452	1.645	0.9268													
RADIUM 226(1)	12	0	0	0	0	0	0	0																																			
RADIUM 228(1)	5	0	0	0	0	0	0	0																																			
STRONTIUM 89 90	32	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.317	0.412	0.382	0.376	1.614	0	1.100	1.541	3	0.2267	17	11	0.4931	1.071	1.645	0.1420															
TRITIUM	31	46	0	0	0	0	0	0	1.00	1.00	1.00	1.00	87.722	126.463	1275.950	134.620	4277.820	0	475.000	430.000	0	1.0000	16	10	0.5178	0.021	1.645	0.4917															
URANIUM TOTAL(2)	0	0	0	0	0	0	0	0																																			
URANIUM 233 234	33	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.637	1.244	1.289	1.040	4.988	0	6.900	3.688	0	1.0000	17	14	0.0352	3.907	1.645	0.0001															
URANIUM 235	32	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.022	0.104	0.084	0.120	0.307	4	0.190	0.560	8	0.0161	18	15	0.0266	2.723	1.645	0.0032															
URANIUM 238	28	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.642	1.393	1.212	1.395	4.885	0	5.930	4.475	0	1.0000	16	13	0.0995	3.147	1.645	0.0008															

(1) No site measurement

(2) No background measurement

TABLE A-33
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Pond Surface Water Filtered Radionuclides
(Concentration Unit pCi/L)

ANALYTE	N	B	N	SDTF	BDTF	S	SLIPP	QUAN	GEHAN	P	T	1	IGNIFICT	UTL	99	NGUTL	PCOC	REMARK
AMERICIUM-241	8	51	1	00	1	00	1	0000	0	9904	0	8733	N	1	755	0	NO	
CESIUM-137	3	18	1	00	1	00	0	0075	0	4211	0	0104	Y	4	708	0	YES(1)	
GROSS ALPHA	13	0	0	00	0	00												NO site measurement
GROSS BETA	14	0	0	00	0	00												NO site measurement
PLUTONIUM-239 240	8	51	1	00	1	00	1	0000	0	9539	0	9662	N	1	016	0	NO	
RADIUM-226	2	0	0	00	0	00												NO site measurement
RADIUM-228	1	0	0	00	0	00												NO site measurement
STRONTIUM-89,90	20	49	1	00	1	00	0	1697	0	9761	0	9430	N	2	013	1	YES	
TRITIUM	13	0	0	00	0	00												NO site measurement
URANIUM,TOTAL	0	0	0	00	0	00												NO measurements
URANIUM-233 234	13	49	1	00	1	00	0	1013	0	1760	0	0640	N	4	192	0	NO	
URANIUM-235	12	49	1	00	1	00	0	8033	0	9861	0	8972	N	0	716	0	NO	
URANIUM-238	13	48	1	00	1	00	0	0155	0	0294	0	0091	Y	3	032	7	YES	

(1) Sample size is too small

TABLE A-34
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of
Pond Surface Water Filtered Radionuclides
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit pCi/L)

ANALYTE	N	B	N	S	ND	B	ND	S	DTF	B	DTF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
AMERICIUM 241	8	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.128	0.007	0.280	0.013	1.755	0	0.800	0.077	0	1.0000	0	0.800	0.077	0	1.0000	0	1.0000	13	9	0.9904	1.142	1.645	0.8733						
CESIUM 137	3	18	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.267	0.183	0.208	0.263	4.708	0	-0.100	0.610	0	16	0.0075	5	5	0.4211	2.312	1.645	0.0104												
GROSS ALPHA(1)	13	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.267	0.183	0.208	0.263	4.708	0	-0.100	0.610	0	16	0.0075	5	5	0.4211	2.312	1.645	0.0104												
GROSS BETA(1)	14	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.267	0.183	0.208	0.263	4.708	0	-0.100	0.610	0	16	0.0075	5	5	0.4211	2.312	1.645	0.0104												
PLUTONIUM 239 240	8	51	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.099	0.016	0.158	0.024	1.016	0	0.400	0.100	0	1.0000	0	0.400	0.100	0	1.0000	0	1.0000	12	9	0.9539	1.828	1.645	0.9662						
RADIUM 226(1)	2	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.099	0.016	0.158	0.024	1.016	0	0.400	0.100	0	1.0000	0	0.400	0.100	0	1.0000	0	1.0000	12	9	0.9539	1.828	1.645	0.9662						
RADIUM 228(1)	1	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.099	0.016	0.158	0.024	1.016	0	0.400	0.100	0	1.0000	0	0.400	0.100	0	1.0000	0	1.0000	12	9	0.9539	1.828	1.645	0.9662						
STRONTIUM 89 90	20	49	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.515	0.406	0.391	0.470	2.013	1	1.000	2.502	5	0.1697	15	8	0.9761	1.581	1.645	0.9430													
TRITIUM(1)	13	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.515	0.406	0.391	0.470	2.013	1	1.000	2.502	5	0.1697	15	8	0.9761	1.581	1.645	0.9430													
URANIUM TOTAL(2)	0	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.906	1.378	0.735	0.995	4.192	0	2.600	3.391	9	0.1013	13	12	0.1760	1.522	1.645	0.0640													
URANIUM 233 234	13	49	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.906	1.378	0.735	0.995	4.192	0	2.600	3.391	9	0.1013	13	12	0.1760	1.522	1.645	0.0640													
URANIUM 235	12	49	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.124	0.066	0.128	0.079	0.716	0	0.300	0.370	1	0.8033	13	8	0.9861	1.266	1.645	0.8972													
URANIUM 238	13	48	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.605	1.401	0.543	1.205	3.032	7	1.700	4.310	15	0.0155	13	13	0.0294	2.360	1.645	0.0091													

(1) No site measurement

(2) No background measurement

TABLE A-35
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Stream Sediment Metals
(Concentration Unit MG/KG)

ANALYTE	N	B	N	S	DTF	B	DTF	S	P	SLIP	P	QUAN	P	GEHAN	P	T	1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
ALUMINUM	59	15			1.00	1.00	1.00	1.00	1.00	1.00	0.6358	0.0705						N	20880.1	0	NO	
ANTIMONY	52	15			0.17	0.13	1.00	1.00				0.4121						N	60.0	0	NO	
ARSENIC	59	15			0.49	0.93	1.00	1.00				0.0007						Y	10.1	0	YES	
BARIUM	57	15			1.00	1.00	1.00	1.00			0.8810	0.0197						Y	250.8	0	YES	
BERYLLIUM	57	15			0.53	0.53	1.00	1.00				0.5367						N	11.6	0	NO	
CADMIUM	51	15			0.29	0.07	1.00	1.00				0.9908						N	3.5	0	NO	
CALCIUM	59	15			1.00	1.00	0.2027				0.0092	0.0001						Y	17888.3	1	YES	
CESIUM	56	15			0.86	0.47	1.00	1.00			1.0000	0.9998						N	513.5	0	NO	
CHROMIUM	59	15			0.83	1.00	1.00	1.00			0.8947	0.4866						N	31.1	0	NO	
COBALT	59	15			0.88	1.00	1.00	1.00				0.0021						Y	19.3	0	YES	
COPPER	59	15			0.80	0.60	1.00	1.00			0.6871	0.7164						N	36.0	0	NO	
IRON	59	15			1.00	1.00	1.00	1.00			0.1471	0.0001						Y	27966.4	0	YES	
LEAD	59	15			1.00	1.00	1.00	1.00			0.6358	0.0602						N	134.3	0	NO	
LITHIUM	57	15			0.91	0.93	1.00	1.00				0.7018						N	41.3	0	NO	
MAGNESIUM	59	15			1.00	1.00	1.00	1.00			0.0436	0.0014						Y	5262.0	0	YES	
MANGANESE	59	15			0.80	1.00	1.00	1.00			0.0436	0.0024						Y	905.0	1	YES	
MERCURY	49	15			0.86	0.27	1.00	1.00				1.0000						N	0.5	0	NO	
MOLYBDENUM	0	0			0.00	0.00																NO site measurement
NICKEL	57	15			0.88	0.47	1.00	1.00				0.3626						N	24.2	0	NO	
POTASSIUM	58	15			1.00	0.93	1.00	1.00			0.0100	0.0002						Y	3112.5	0	YES	
SELENIUM	58	15			0.40	0.13	1.00	1.00				0.8914						N	3.5	0	NO	
SILICON	0	0			0.00	0.00																NO site measurement
SILVER	54	15			0.48	0.07	1.00	1.00				0.9170						N	12.0	0	NO	
SODIUM	59	15			0.69	0.87	1.00	1.00				0.0806						N	1745.1	0	NO	
STRONTIUM	58	15			0.88	1.00	1.00	1.00				0.0079						Y	294.8	0	YES	
THALLIUM	50	15			0.40	0.33	1.00	1.00				0.8391						N	2.3	0	NO	
TIN	0	0			0.00	0.00																NO site measurement
VANADIUM	57	15			0.70	1.00	1.00	1.00				0.0128						Y	63.4	0	YES	
ZINC	59	15			0.95	1.00	1.00	1.00			0.0144	0.0005						Y	307.8	0	YES	

TABLE A-36
ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Results of

Stream Sediment Metals
(Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
(Concentration Unit MG/KG)

ANALYTE	N.B	N.S	ND.B	ND.S	DTF.B	DTF.S	MEAN.B	MEAN.S	STD.B	STD.S	UTL99	NGUTL	MAX.B	MAX.S	NGM	P.SLP	N.T20	N.SITE	P.QUAN	Z.CAL	Z.95	P.VAL
ALUMINUM	59	15	0	0	1.00	1.00	5887.6	6922.3	4912.7	2881.1	20880.1	0	25200.0	11600.0	0	1.0000	15	3	0.6358	1.472	1.645	0.0705
ANTIMONY	52	15	43	13	0.17	0.13	7.4	8.1	7.9	5.9	60.0	0	60.0	26.3	0	1.0000	999	999	999 0000	0.222	1.645	0.4121
ARSENIC	59	15	30	1	0.49	0.93	2.4	3.6	2.5	1.3	10.1	0	17.3	5.8	0	1.0000	999	999	999 0000	3.198	1.645	0.0007
BARUM	57	15	0	0	1.00	1.00	77.9	106.6	56.4	32.5	250.8	0	244.0	177.0	0	1.0000	15	2	0.8810	2.059	1.645	0.0197
BERYLLIUM	57	15	27	7	0.53	0.53	1.2	0.6	3.4	0.2	11.6	0	26.0	1.0	0	1.0000	999	999	999 0000	-0.092	1.645	0.5367
CADMIUM	51	15	36	14	0.29	0.07	0.9	0.5	0.8	0.1	3.5	0	5.0	0.8	0	1.0000	999	999	999 0000	2.359	1.645	0.9908
CALCIUM	59	15	0	0	1.00	1.00	3659.8	13263.7	4662.4	23046.1	17888.3	1	17100.0	95700.0	1	0.2027	15	7	0.0092	4.054	1.645	0.0001
CESTUM	56	15	8	8	0.86	0.47	139.9	60.3	121.4	43.9	513.5	0	621.0	18.1	0	1.0000	15	0	1.0000	3.499	1.645	0.9998
CHROMIUM	59	15	10	0	0.83	1.00	8.3	6.9	7.5	3.5	31.1	0	29.7	12.3	0	1.0000	16	2	0.8947	0.034	1.645	0.4866
COBALT	59	15	7	0	0.88	1.00	6.5	8.2	4.2	2.0	19.3	0	50.0	12.4	0	1.0000	999	999	999 0000	2.859	1.645	0.0021
COPPER	59	15	12	6	0.80	0.60	11.0	9.5	8.2	6.6	36.0	0	36.7	17.7	0	1.0000	16	3	0.6871	-0.572	1.645	0.7164
IRON	59	15	0	0	1.00	1.00	8852.6	13810.0	6263.2	3237.4	27966.4	0	31400.0	21500.0	0	1.0000	15	5	0.1471	3.812	1.645	0.0001
LEAD	59	15	0	0	1.00	1.00	22.0	20.9	36.8	21.8	134.3	0	244.0	94.8	0	1.0000	15	3	0.6358	1.553	1.645	0.0602
LITHIUM	57	15	5	1	0.91	0.93	11.0	7.0	9.9	3.0	41.3	0	45.8	15.2	0	1.0000	999	999	999 0000	0.529	1.645	0.7018
MAGNESIUM	59	15	0	0	1.00	1.00	1494.7	2317.0	1234.5	848.3	5262.0	0	5850.0	3580.0	0	1.0000	15	6	0.0436	2.978	1.645	0.0014
MANGANESE	59	15	12	0	0.80	1.00	216.9	366.5	225.5	240.4	905.0	1	1280.0	1000.0	0	1.0000	15	6	0.0436	2.816	1.645	0.0024
MERCURY	49	15	7	11	0.86	0.27	0.1	0.1	0.1	0.0	0.5	0	0.6	0.1	0	1.0000	999	999	999 0000	4.175	1.645	1.0000
MOLYBDENUM(1)																						
NICKEL	57	15	7	8	0.88	0.47	8.1	8.3	5.3	5.4	24.2	0	40.0	19.2	0	1.0000	999	999	999 0000	0.352	1.645	0.3626
POTASSIUM	58	15	0	1	1.00	0.93	909.7	1492.4	720.0	559.1	3112.5	0	3770.0	2660.0	0	1.0000	15	7	0.0100	3.489	1.645	0.0002
SELENIUM	58	15	35	13	0.40	0.13	0.9	0.5	0.8	0.0	3.5	0	5.0	0.5	0	1.0000	999	999	999 0000	1.234	1.645	0.8914
SILICON(1)																						
SILVER	54	15	28	14	0.48	0.07	2.3	1.0	3.1	0.1	12.0	0	25.0	1.4	0	1.0000	999	999	999 0000	1.385	1.645	0.9170
SODIUM	59	15	18	2	0.69	0.87	303.9	258.0	472.3	135.4	1745.1	0	5000.0	483.0	0	1.0000	999	999	999 0000	1.401	1.645	0.0806
STRONTIUM	58	15	7	0	0.88	1.00	50.8	48.7	79.8	25.1	294.8	0	421.0	95.8	0	1.0000	999	999	999 0000	2.412	1.645	0.0079
THALLIUM	50	15	30	10	0.40	0.33	0.7	0.8	0.5	0.3	2.3	0	2.6	0.5	0	1.0000	999	999	999 0000	0.991	1.645	0.8391
TIN(1)																						
VANADIUM	57	15	17	0	0.70	1.00	18.7	23.4	14.6	6.7	63.4	0	73.0	33.9	0	1.0000	999	999	999 0000	2.232	1.645	0.0128
ZINC	59	15	3	0	0.95	1.00	54.3	75.3	83.0	35.9	307.8	0	639.0	178.0	0	1.0000	16	7	0.0144	3.268	1.645	0.0005

(1) No site measurement

TABLE A-37
ROCKY FLATS PLANT, OU-6
Background Comparison Summary of
Stream Sediment Radionuclides
(Concentration Unit pCi/G)

ANALYTE	N_B	N_S	DTF_B	DTF_S	P_SLIP	P_QUAN	P_GEHAN	P_T_1	SIGNIFICT	UTL99	NGUTL	PCOC	REMARK
AMERICIUM-241	37	15	1.00	1.00	1.0000	0.3923	0.0031		Y	1 770	0	YES	
CESIUM-137	35	15	1.00	1.00	1.0000	0.9821	0.5551		N	1 541	0	NO	
GROSS ALPHA	45	15	1.00	1.00	1.0000	1.0000	0.6776		N	88 058	0	NO	
GROSS BETA	43	15	1.00	1.00	1.0000	1.0000	1.0000		N	67 337	0	NO	
PLUTONIUM-239,240	45	15	1.00	1.00	1.0000	0.0355	0.0059		Y	5 658	0	YES	
RADIUM-226	21	1	1.00	1.00	1.0000	1.0000	0.3466		N	2 216	0	NO(1)	
RADIUM-228	20	1	1.00	1.00	1.0000	1.0000	0.4344		N	4 547	0	NO(1)	
STRONTIUM-89,90	43	8	1.00	1.00	1.0000	0.5572	0.6464		N	1 087	0	NO	
TRITIUM(2)	42	15	1.00	1.00	0.2632	0.0460	0.5576		Y	1047 685	1	YES	NO site measurement
URANIUM,TOTAL	0	0											
URANIUM-233,234	47	15	1.00	1.00	1.0000	1.0000	0.9942		N	5 293	0	NO	
URANIUM-235	49	15	1.00	1.00	1.0000	1.0000	0.9351		N	0 212	0	NO	
URANIUM-238	36	15	1.00	1.00	1.0000	1.0000	0.9530		N	4 817	0	NO	

(1) Sample size is too small
(2) Concentration Unit pCi/L

TABLE A-38

ROCKY FLATS PLANT, OU-6
Background Comparison Statistical Test Result of
Stream Sediment Radionuclides
 (Slippage Test, Quantile Test, Gehan Test, UTL Comparison)
 (Concentration Unit pCi/G)

ANALYTE	N	B	N	S	ND	B	ND	S	DIF	B	DIF	S	MEAN	B	MEAN	S	STD	B	STD	S	UTL99	NGUTL	MAX	B	MAX	S	NGM	P	SLP	N	T20	N	SITE	P	QUAN	Z	CAL	Z	95	P	VAL
AMERICIUM 241	37	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.173	0.125	0.484	0.200	1.770	0	2.526	0.75	0	1.0000	11	4	0.3923	2.738	1.645	0.0031													
CESIUM 137	35	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.262	0.141	0.383	0.107	1.541	0	1.500	0.44	0	1.0000	10	1	0.9821	-0.138	1.645	0.5551													
GROSS ALPHA	45	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	22.976	13.065	20.463	3.446	88.058	0	72.000	18.00	0	1.0000	12	0	1.0000	-0.461	1.645	0.6776													
GROSS BETA	43	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	35.349	24.608	9.978	2.202	67.337	0	59.000	27.80	0	1.0000	12	0	1.0000	-4.271	1.645	1.0000													
PLUTONIUM 239 240	45	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.537	0.287	1.610	0.509	5.658	0	8.933	1.95	0	1.0000	12	6	0.0355	2.519	1.645	0.0059													
RADIUM 226	21	1	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.849	0.930	0.362		2.216	0	1.800	0.93	0	1.0000	5	0	1.0000	0.395	1.645	0.3466													
RADIUM 228	20	1	0	0	0	0	0	0	1.00	1.00	1.00	1.00	1.701	1.600	0.743		4.547	0	3.453	1.60	0	1.0000	5	0	1.0000	0.165	1.645	0.4344													
STRONTIUM 89 90	43	8	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.206	0.190	0.275	0.171	1.087	0	1.165	0.49	0	1.0000	11	2	0.5572	-0.376	1.645	0.6464													
TRITIUM (1)	42	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	194.297	977.603	265.068	2844.995	1047.685	1	1770.000	11200.00	1	0.2632	12	6	0.0460	-0.145	1.645	0.5576													
URANIUM TOTAL(2)	0	0	0	0	0	0	0	0																																	
URANIUM 233 234	47	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	1.677	0.904	1.145	0.301	5.293	0	4.500	1.64	0	1.0000	13	0	1.0000	2.523	1.645	0.9942													
URANIUM 235	49	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	0.062	0.040	0.048	0.026	0.212	0	0.191	0.08	0	1.0000	13	0	1.0000	1.515	1.645	0.9351													
URANIUM 238	36	15	0	0	0	0	0	0	1.00	1.00	1.00	1.00	1.399	0.868	1.031	0.260	4.817	0	3.820	1.42	0	1.0000	11	0	1.0000	1.675	1.645	0.9530													

(1) Concentration Unit pCi/L

(2) No background measurement

APPENDIX B
RISK BASED EVALUATION OF INFREQUENTLY DETECTED CHEMICALS

APPENDIX B

RISK-BASED EVALUATION OF INFREQUENTLY DETECTED CHEMICALS

B.1 PURPOSE AND APPROACH

The chemicals of concern evaluated in a quantitative human health risk assessment are the subset of all site-related chemicals that are thought to pose the greatest potential risk to human health. The determination that these chemicals may pose the greatest potential risk is generally based on an evaluation of the following three criteria:

- The inherent toxicity of the chemical
- The concentrations of the chemical found on-site and
- The potential for human exposure to the chemical (e.g., whether or not the chemical is widely distributed across the site or could readily migrate from the site)

In general, compounds found at low frequency (<5% of all samples for a particular media) are not included as chemicals of concern because the potential for human exposure is limited. However, all infrequently detected compounds were evaluated according to the procedures shown in Figure 2-1 so as not to neglect infrequently detected chemicals that could contribute significantly to risk if they were co-located with other potentially hazardous compounds at source areas or location where routine exposure could occur.

This evaluation examines those metals (detected above background) and organic chemicals that were initially excluded from the chemicals of concern based on low frequency of detection, using a health-based screening approach. A screening evaluation was performed using preliminary remediation goals (PRGs) calculated in guidance provided by DOE (1994). The screening evaluation was performed for all low-frequency chemicals for which PRGs were available. As a benchmark, it was assumed that any infrequently detected chemical whose maximum concentration was greater than 1000 times the PRG warrants further evaluation. The purpose is to identify those infrequently detected chemicals that may pose

an unacceptable health risk (cancer or non-cancer) if chronic exposure were to occur. These chemicals are retained for separated evaluation in the risk assessment. Since they are not characteristic of contamination in OU-6, risk will be assessed separately at the locations where the special case chemicals are found.

PRGs were calculated assuming a residential exposure scenario, using standard toxicity values (RfDs and SFs) established by EPA, and using the exposure assumptions outlined below (DOE 1994). For surface soils, subsurface soils, pond sediments, and stream sediments, multiple pathway exposure was assumed (ingestion and inhalation of particulates) in calculating PRGs. The PRG for residential soil (surface soil) is used for all types of soil and sediment in this evaluation. For carcinogenic effects the target excess lifetime cancer risk is assumed to be 10^{-6} (1 in 1,000,000), the exposure frequency is 350 days/year, exposure duration is 30 years, averaging time is 70 years, daily inhalation rate is 20 m³/day, the particulate emission factor (for non-volatile organics and inorganics) is 4.63×10^9 m³/kg, body weight is 70 kg, and the age-adjusted soil ingestion factor is 114 mg-yr/kg-day. All exposure parameters are EPA standard default exposures for adult residents, except for soil ingestion, which is a time-weighted average for child and adult exposures. For noncarcinogenic effects, all of the exposure parameters are the same as the carcinogenic exposure parameters except the averaging time is 30 years and instead of a target excess lifetime cancer risk, the target hazard index is 1.

The PRGs for groundwater also assume a residential scenario including ingestion and inhalation of volatile organic chemicals released during use. The residential groundwater PRGs are also used in the evaluation of pond surface water, even though surface water is not expected to be used for domestic drinking water. The PRGs for residential groundwater are more conservative than the PRGs for residential surface water (based on swimming exposures), therefore providing more stringent screening criteria for chemicals found in pond surface water. The exposure parameters for groundwater are: target excess lifetime cancer risk of 10^{-6} (1 in 1,000,000), body weight of 70 kg, averaging time of 70 years, exposure frequency of 350 days/yr, exposure duration of 30 years, daily indoor inhalation rate of 15 m³/day, a volatilization factor (for volatile organic chemicals) of 0.5 L/m³, and a daily ingestion rate of 2 L/day. All exposures are EPA standard default exposures for adult residents. For noncarcinogenic effects, all of the exposure parameters are the same as the

carcinogenic exposure parameters except the averaging time is 30 years and instead of a target excess lifetime cancer risk, the target hazard index is 1

B.2 SURFACE SOIL

One metal (molybdenum) and one PCB (Aroclor-1254) were detected at low frequency (<5% detection) in surface soil samples. Table B-1 presents a comparison of the maximum detected concentrations to the health-based screening criteria (both cancer and non-cancer). Chemicals whose maximum detected concentration were greater than 1000 times either the cancer or non-cancer PRGs will be retained for further evaluation as special case chemicals of concern. Table B-1 shows that neither molybdenum nor Aroclor-1254 had concentrations above the 1000 times the PRG, and therefore they will not require further evaluation in the risk assessment.

B.3 SUBSURFACE SOIL

Twelve VOCs and SVOCs were reported at less than 5 percent frequency in subsurface soils. These are listed in Table B-2. None of the twelve chemicals exceeded the 1000 times the PRG, and therefore they will not require further evaluation in the risk assessment.

B.4 GROUNDWATER

Table B-3 lists 15 organic chemicals detected at less than 5 percent frequency in groundwater. Of these, two (1,2,4-trimethylbenzene and 2-hexanone) do not have PRGs. Table B-6 shows the chemicals detected at low frequency in all media for which there are no PRGs. None of the remaining 13 chemicals were detected at concentrations exceeding the screening-level criteria, and they will not require further evaluation in the risk assessment.

B.5 POND SEDIMENT

Twelve VOCs, SVOCs, pesticides and PCBs were detected at less than 5 percent frequency in pond sediments. Dibenzofuran and 2-methylnaphthalene were detected at low frequency, but do not have PRGs and are listed on Table B-6. The remaining ten chemicals are listed

on Table B-4 None of the ten chemicals were detected at concentrations exceeding 1000 times the PRG, and they will not require further evaluation in the risk assessment

B.6 POND SURFACE WATER

Table B-5 lists the two chemicals (1,2-dichloroethane and tetrachloroethene) detected at low frequency in pond surface water Neither chemical exceeded the screening-level criteria, and they will not require further evaluation in the risk assessment

B.7 STREAM SEDIMENT

No chemicals were detected at low frequency in stream sediments, therefore, a screening-level evaluation was not performed

References

Department of Energy (DOE) 1994 Programmatic Preliminary Remediation Goals Draft
Final Rocky Flats Plant Golden, CO June 1994

TABLE B-1
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
COMPARISON TO PRGs
SURFACE SOIL

Chemical	Maximum Detected Conc (mg/kg)	Residential Soil PRG (mg/kg)	Max Conc > PRG?	Max Conc > 1000 x PRG?
Organic Compounds				
Aroclor-1254	0.425	8.32E-02	YES	NO
Metals				
Chromium	35.1	2.74E+05	NO	NO
Molybdenum	9.9	1.37E+03	NO	NO
Silver	52.7	1.37E+03	NO	NO
Uranium-233/234 (pCi/g)	2.02	4.47E+01	NO	NO

TABLE B-2
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
COMPARISON TO PRGs
SUBSURFACE SOIL⁽¹⁾

Chemical	Maximum Detected Conc (mg/kg)	Residential Soil PRG (mg/kg)	Max Conc > PRG?	Max Conc > 1000 x PRG?
Organic Compounds				
1,4-Dichlorobenzene	0.064	2.67E+01	NO	NO
4-Methyl-2-pentanone	0.004	1.37E+04	NO	NO
Acenaphthene	0.056	1.65E+04	NO	NO
Benzene	0.006	2.21E+01	NO	NO
Benzo(a)anthracene	0.099	8.77E-01	NO	NO
Benzo(k)fluoranthene	0.06	8.77E+00	NO	NO
Chlorobenzene	0.074	5.49E+03	NO	NO
Chloroform	0.002	1.05E+02	NO	NO
Chrysene	0.12	8.77E+01	NO	NO
Diethyl phthalate	0.3	2.20E+05	NO	NO
Di-n-octyl phthalate	0.072	5.49E+03	NO	NO
Indeno(1,2,3-cd)pyrene	0.099	8.77E-01	NO	NO
Pentachlorophenol	0.66	5.34E+00	NO	NO
Phenol	0.055	1.65E+05	NO	NO
Styrene	0.001	5.49E+04	NO	NO
Trichloroethene	0.021	5.82E+01	NO	NO
Xylenes total	0.002	5.49E+05	NO	NO
Metals and Radionuclides				
Vanadium	118	1.92E+03	NO	NO
Uranium-238 (pCi/g)	141	4.60E+01	YES	NO

⁽¹⁾ Excluding Old Outfall (IHSS 143)

TABLE B-3
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
COMPARISON TO PRGs
UHSU GROUNDWATER

Chemical	Maximum Detected Conc (mg/l)	Residential Groundwater PRG (mg/l)	Max Conc > PRG?	Max Conc > 1000 x PRG?
Organic Compounds				
1,1-Dichloroethene	0.005	1.67E-05	YES	NO
1,2-Dichloroethane	0.002	1.97E-04	YES	NO
1,2-Dichloroethene, trans ⁽¹⁾	0.009	3.28E-01	NO	NO
2-Butanone	0.001	2.47E+00	NO	NO
4-Methyl-2-pentanone	0.002	1.98E-01	NO	NO
Benzene	0.003	6.15E-04	YES	NO
Carbon disulfide	0.004	2.76E-02	NO	NO
Carbon tetrachloride	0.008	2.60E-04	YES	NO
Chloromethane	0.00025	2.32E-03	NO	NO
Ethylbenzene	0.001	1.58E+00	NO	NO
Styrene	0.00011	2.01E+00	NO	NO
Vinyl chloride	0.86	2.81E-05	YES	YES
Xylenes (total)	0.014	7.30E+01	NO	NO

⁽¹⁾ The PRG for 1,2-Dichloroethene, total was used

TABLE B-4
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
COMPARISON TO PRGs
POND SEDIMENT

Chemical	Maximum Detected Conc (mg/kg)	Residential Soil PRG (mg/kg)	Max Conc > PRG?	Max Conc > 1000 x PRG?
Organic Compounds				
1,2,4-Trichlorobenzene	0.13	2.74E+03	NO	NO
4-Methyl-2-pentanone	0.006	1.37E+04	NO	NO
Aldrin	0.054	3.77E-02	YES	NO
Aroclor-1260	0.86	8.32E-02	YES	NO
Dibenzo(a,h)anthracene	0.15	8.77E-02	YES	NO
Fluorene	0.46	1.10E+04	NO	NO
gamma-BHC (Lindane)	0.025	4.93E-01	NO	NO
Heptachlor	0.039	1.42E-01	NO	NO
Naphthalene	0.39	1.10E+04	NO	NO
Phenol	0.29	1.65E+05	NO	NO
Metals				
Antimony	68.5	1.10E+02	NO	NO

TABLE B-5
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
COMPARISON TO PRGs
POND SURFACE WATER

Chemical	Maximum Detected Conc (mg/l)	Residential Groundwater PRG (mg/l)	Max Conc > PRG?	Max Conc > 1000 x PRG?
Organic Compounds				
1,2-Dichloroethane	0.001	1.97E-04	YES	NO
Tetrachloroethene	0.012	1.43E-03	YES	NO

TABLE B-6
ROCKY FLATS PLANT OU-6
INFREQUENTLY DETECTED COMPOUNDS
WITHOUT PRGs

Chemical
Groundwater
1,2,4-Trimethylbenzene
2-Hexanone
Pond Sediment
2-Methylnaphthalene
Dibenzofuran

TOTAL SUSPENDED SOLIDS BY WELL NUMBER

SITE	LOCATION	FIELDID	METHOD	ANALYTE	RESULT	REP_LIM	UNITS	QUAL_LA
165	76292	GW00467WC	WQPL	TOTAL SUSPENDED SOLIDS	20 00	5 00	MG/L	
165	76292	GW00533WC	WQPL	TOTAL SUSPENDED SOLIDS	700 00	5 00	MG/L	
143	77492	GW00469WC	WQPL	TOTAL SUSPENDED SOLIDS	1300 00	5 00	MG/L	
143	77492	GW00534WC	WQPL	TOTAL SUSPENDED SOLIDS	3500 00	5 00	MG/L	
GW PPMON	02691	GW01630WC	WQPL	TOTAL SUSPENDED SOLIDS	100 00	4 00	MG/L	
EMAD	02691	GW02856IT	WQPL	TOTAL SUSPENDED SOLIDS	350 00	4 00	MG/L	
GW PPMON	02691	GW00693WC	WQPL	TOTAL SUSPENDED SOLIDS	360 00	5 00	MG/L	
EMAD	02691	GW02513IT	WQPL	TOTAL SUSPENDED SOLIDS	410 00	4 00	MG/L	
GW PPMON	02691	GW01218WC	WQPL	TOTAL SUSPENDED SOLIDS	411 00	5 00	MG/L	
GW PPMON	02691	GW00260WC	WQPL	TOTAL SUSPENDED SOLIDS	420 00	5 00	MG/L	
EMAD	02691	GW03215IT	WQPL	TOTAL SUSPENDED SOLIDS	564 00	5 00	MG/L	
EMAD	02691	GW02172IT	WQPL	TOTAL SUSPENDED SOLIDS	660 00	4 00	MG/L	
GW PPMON	02691	GW03826IT	WQPL	TOTAL SUSPENDED SOLIDS	830.00	4 00	MG/L	
EMAD	0486	GW02613IT	WQPL	TOTAL SUSPENDED SOLIDS	150 00	4 00	MG/L	
EMAD	0486	GW02957IT	WQPL	TOTAL SUSPENDED SOLIDS	820 00	5 00	MG/L	
GW PPMON	0486	GW03807IT	WQPL	TOTAL SUSPENDED SOLIDS	860 00	5 00	MG/L	
EMAD	0486	GW01456IT	WQPL	TOTAL SUSPENDED SOLIDS	950 00	4 00	MG/L	
GW PPMON	0486	GW03391IT	WQPL	TOTAL SUSPENDED SOLIDS	1100 00	5 00	MG/L	
EMAD	0486	GW01763IT	WQPL	TOTAL SUSPENDED SOLIDS	1400 00	4 00	MG/L	
EMAD	0486	GW02027IT	WQPL	TOTAL SUSPENDED SOLIDS	4400 00	4 00	MG/L	
GW PPMON	0586	GW00549WC	WQPL	TOTAL SUSPENDED SOLIDS	15 00	5 00	MG/L	
EMAD	0586	GW01538IT	WQPL	TOTAL SUSPENDED SOLIDS	19 00	4 00	MG/L	
EMAD	0586	GW02670IT	WQPL	TOTAL SUSPENDED SOLIDS	50 00	4 00	MG/L	
EMAD	0686	GW02671IT	WQPL	TOTAL SUSPENDED SOLIDS	36 00	4 00	MG/L	
EMAD	0686	GW03150IT	WQPL	TOTAL SUSPENDED SOLIDS	40 00	4 00	MG/L	
EMAD	1186	GW01539IT	WQPL	TOTAL SUSPENDED SOLIDS	60 00	4 00	MG/L	
GW PPMON	1186	GW03618IT	WQPL	TOTAL SUSPENDED SOLIDS	150 00	5 00	MG/L	
EMAD	1186	GW01902IT	WQPL	TOTAL SUSPENDED SOLIDS	210 00	4 00	MG/L	
EMAD	1186	GW02242IT	WQPL	TOTAL SUSPENDED SOLIDS	220 00	4 00	MG/L	
GW PPMON	1186	GW01225IT	WQPL	TOTAL SUSPENDED SOLIDS	290 00	4 00	MG/L	
GW PPMON	1186	GW00998IT	WQPL	TOTAL SUSPENDED SOLIDS	400 00	4 00	MG/L	
EMAD	1186	GW02669IT	WQPL	TOTAL SUSPENDED SOLIDS	580 00	4 00	MG/L	
EMAD	1186	GW03152IT	WQPL	TOTAL SUSPENDED SOLIDS	750 00	4 00	MG/L	
EMAD	1286	GW02245IT	WQPL	TOTAL SUSPENDED SOLIDS	730 00	4 00	MG/L	
EMAD	1286	GW03095IT	WQPL	TOTAL SUSPENDED SOLIDS	1400 00	4 00	MG/L	
EMAD	1286	GW02677IT	WQPL	TOTAL SUSPENDED SOLIDS	21000 00	4 00	MG/L	
EMAD	1386	GW03232IT	WQPL	TOTAL SUSPENDED SOLIDS	6 00	4 00	MG/L	
123456	1386	GW01210IT	WQPL	TOTAL SUSPENDED SOLIDS	12 00	4 00	MG/L	
GW PPMON	1386	GW00562WC	WQPL	TOTAL SUSPENDED SOLIDS	14 00	5 00	MG/L	
EMAD	1386	GW02659IT	WQPL	TOTAL SUSPENDED SOLIDS	15 00	4 00	MG/L	
GW PPMON	1386	GW00145WC	WQPL	TOTAL SUSPENDED SOLIDS	20 00	5 00	MG/L	
GW PPMON	1386	GW01421WC	WQPL	TOTAL SUSPENDED SOLIDS	27 00	5 00	MG/L	
123456	1386	GW00972IT	WQPL	TOTAL SUSPENDED SOLIDS	28 00	4 00	MG/L	
EMAD	1386	GW01482IT	WQPL	TOTAL SUSPENDED SOLIDS	33 00	4 00	MG/L	
EMAD	1386	GW01880IT	WQPL	TOTAL SUSPENDED SOLIDS	35 00	4 00	MG/L	
GW PPMON	1386	GW00046GA	WQPL	TOTAL SUSPENDED SOLIDS	37 00	4 00	MG/L	
EMAD	1386	GW02237IT	WQPL	TOTAL SUSPENDED SOLIDS	38 00	4 00	MG/L	
GW PPMON	1386	GW03621IT	WQPL	TOTAL SUSPENDED SOLIDS	44 00	5 00	MG/L	

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GW PPMON	1386	GW01132WC	WQPL	TOTAL SUSPENDED SOLIDS	58 00	4 00	MG/L	
GW PPMON	1586	GW03627IT	WQPL	TOTAL SUSPENDED SOLIDS	5 00	5 00	MG/L	U
GW PPMON	1586	GW00555WC	WQPL	TOTAL SUSPENDED SOLIDS	47 00	5 00	MG/L	
EMAD	1586	GW01882IT	WQPL	TOTAL SUSPENDED SOLIDS	100 00	4 00	MG/L	
EMAD	1586	GW02676IT	WQPL	TOTAL SUSPENDED SOLIDS	110 00	4 00	MG/L	
EMAD	1586	GW01509IT	WQPL	TOTAL SUSPENDED SOLIDS	130 00	4 00	MG/L	
GW PPMON	1586	GW01120IT	WQPL	TOTAL SUSPENDED SOLIDS	130 00	4 00	MG/L	
EMAD	1586	GW02240IT	WQPL	TOTAL SUSPENDED SOLIDS	170 00	4 00	MG/L	
GW PPMON	1586	GW01415WC	WQPL	TOTAL SUSPENDED SOLIDS	250 00	4 00	MG/L	
GW PPMON	1586	GW00136WC	WQPL	TOTAL SUSPENDED SOLIDS	280 00	4 00	MG/L	
EMAD	1586	GW03182IT	WQPL	TOTAL SUSPENDED SOLIDS	360 00	4 00	MG/L	
GW PPMON	1586	GW01125WC	WQPL	TOTAL SUSPENDED SOLIDS	504 00	5 00	MG/L	
GW PPMON	1586	GW00904IT	WQPL	TOTAL SUSPENDED SOLIDS	760 00	4 00	MG/L	
123456	1786	GW01116IT	WQPL	TOTAL SUSPENDED SOLIDS	1200 00	4 00	MG/L	
GW PPMON	1786	GW01127WC	WQPL	TOTAL SUSPENDED SOLIDS	1274 00	5 00	MG/L	
EMAD	1786	GW01878IT	WQPL	TOTAL SUSPENDED SOLIDS	1300 00	4 00	MG/L	
123456	1786	GW00905IT	WQPL	TOTAL SUSPENDED SOLIDS	1380 00		MG/L	
EMAD	1786	GW02640IT	WQPL	TOTAL SUSPENDED SOLIDS	1500 00	4 00	MG/L	
GW PPMON	1786	GW01416WC	WQPL	TOTAL SUSPENDED SOLIDS	1500 00	4 00	MG/L	
GW PPMON	1786	GW03630IT	WQPL	TOTAL SUSPENDED SOLIDS	1590 00	5 00	MG/L	
EMAD	1786	GW01474IT	WQPL	TOTAL SUSPENDED SOLIDS	2100 00	4 00	MG/L	
EMAD	1786	GW03190IT	WQPL	TOTAL SUSPENDED SOLIDS	2100 00	4 00	MG/L	
EMAD	1786	GW02210IT	WQPL	TOTAL SUSPENDED SOLIDS	3300 00	4 00	MG/L	
GW PPMON	1786	GW00557WC	WQPL	TOTAL SUSPENDED SOLIDS	6700 00	4 00	MG/L	
GW PPMON	1786	GW00138WC	WQPL	TOTAL SUSPENDED SOLIDS	11000 00	5 00	MG/L	
EMAD	3586	GW03217IT	WQPL	TOTAL SUSPENDED SOLIDS	5 00	5 00	MG/L	U
GW PPMON	3586	GW01244WC	WQPL	TOTAL SUSPENDED SOLIDS	32 00	4 00	MG/L	
GW PPMON	3586	GW01701WC	WQPL	TOTAL SUSPENDED SOLIDS	42 00	4 00	MG/L	
EMAD	3586	GW01461IT	WQPL	TOTAL SUSPENDED SOLIDS	54 00	4 00	MG/L	
EMAD	3586	GW02631IT	WQPL	TOTAL SUSPENDED SOLIDS	62 00	4 00	MG/L	
GW PPMON	3586	GW00695WC	WQPL	TOTAL SUSPENDED SOLIDS	69 00	4 00	MG/L	
GW PPMON	3586	GW00262WC	WQPL	TOTAL SUSPENDED SOLIDS	69 00	4 00	MG/L	
EMAD	3586	GW02195IT	WQPL	TOTAL SUSPENDED SOLIDS	100 00	4 00	MG/L	
GW PPMON	3586	GW03828IT	WQPL	TOTAL SUSPENDED SOLIDS	120 00	4 00	MG/L	
GW PPMON	3586	GW00976IT	WQPL	TOTAL SUSPENDED SOLIDS	130 00	4 00	MG/L	
EMAD	3586	GW01818IT	WQPL	TOTAL SUSPENDED SOLIDS	160 00	4 00	MG/L	
GW PPMON	3586	GW01221IT	WQPL	TOTAL SUSPENDED SOLIDS	170 00	4 00	MG/L	
EMAD	3686	GW02632IT	WQPL	TOTAL SUSPENDED SOLIDS	33 00	4 00	MG/L	
123456	3686	GW01222IT	WQPL	TOTAL SUSPENDED SOLIDS	38 00	4 00	MG/L	
GW PPMON	3786	GW01685WC	WQPL	TOTAL SUSPENDED SOLIDS	19 00	4 00	MG/L	
EMAD	3786	GW01899IT	WQPL	TOTAL SUSPENDED SOLIDS	22 00	4 00	MG/L	
123456	3786	GW00995IT	WQPL	TOTAL SUSPENDED SOLIDS	23 00	4 00	MG/L	
GW PPMON	3786	GW03233IT	WQPL	TOTAL SUSPENDED SOLIDS	25 00	5 00	MG/L	
EMAD	3786	GW01521IT	WQPL	TOTAL SUSPENDED SOLIDS	26 00	4 00	MG/L	
EMAD	3786	GW02656IT	WQPL	TOTAL SUSPENDED SOLIDS	32 00	4 00	MG/L	
GW PPMON	3786	GW00155GA	WQPL	TOTAL SUSPENDED SOLIDS	44 00	4 00	MG/L	
GW PPMON	3786	GW03641IT	WQPL	TOTAL SUSPENDED SOLIDS	49 00	5 00	MG/L	
GW PPMON	3786	GW01362WC	WQPL	TOTAL SUSPENDED SOLIDS	50 00	4 00	MG/L	
123456	3786	GW01223IT	WQPL	TOTAL SUSPENDED SOLIDS	60 00	4 00	MG/L	

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GW_PPMON	3886	GW00128WC	WQPL	TOTAL SUSPENDED SOLIDS	20 00	5 00	MG/L	
EMAD	3886	GW02657IT	WQPL	TOTAL SUSPENDED SOLIDS	28 00	4 00	MG/L	
EMAD	3886	GW01224IT	WQPL	TOTAL SUSPENDED SOLIDS	40 00	4 00	MG/L	
GW_PPMON	3886	GW00552WC	WQPL	TOTAL SUSPENDED SOLIDS	61 00	5 00	MG/L	
EMAD	4087	GW02790IT	WQPL	TOTAL SUSPENDED SOLIDS	19 00	4 00	MG/L	
EMAD	4087	GW01529IT	WQPL	TOTAL SUSPENDED SOLIDS	32 00	4 00	MG/L	
GW_PPMON	4087	GW00501WC	WQPL	TOTAL SUSPENDED SOLIDS	34 00	5 00	MG/L	
EMAD	4087	GW02313IT	WQPL	TOTAL SUSPENDED SOLIDS	39 00	4 00	MG/L	
GW_PPMON	41091	GW01286WC	WQPL	TOTAL SUSPENDED SOLIDS	4 00	4 00	MG/L	U
GW_PPMON	41091	GW00550WC	WQPL	TOTAL SUSPENDED SOLIDS	42 00	5 00	MG/L	
GW_PPMON	41091	GW01475WC	WQPL	TOTAL SUSPENDED SOLIDS	80 00	5 00	MG/L	
GW_PPMON	41091	GW01172WC	WQPL	TOTAL SUSPENDED SOLIDS	110 00	4 00	MG/L	
EMAD	41091	GW03050IT	WQPL	TOTAL SUSPENDED SOLIDS	130 00	5 00	MG/L	
GW_PPMON	41091	GW00125WC	WQPL	TOTAL SUSPENDED SOLIDS	190 00	4 00	MG/L	
EMAD	41091	GW02609IT	WQPL	TOTAL SUSPENDED SOLIDS	250 00	4 00	MG/L	
GW_PPMON	41091	GW03616IT	WQPL	TOTAL SUSPENDED SOLIDS	287 00	5 00	MG/L	
EMAD	41091	GW02171IT	WQPL	TOTAL SUSPENDED SOLIDS	330 00	4 00	MG/L	
EMAD	41091	GW03153IT	WQPL	TOTAL SUSPENDED SOLIDS	660 00	4 00	MG/L	
GW_PPMON	41691	GW00247GA	WQPL	TOTAL SUSPENDED SOLIDS	140 00	4 00	MG/L	
GW_PPMON	41691	GW01357WC	WQPL	TOTAL SUSPENDED SOLIDS	434 00	5 00	MG/L	
GW_PPMON	41691	GW00400GA	WQPL	TOTAL SUSPENDED SOLIDS	610 00	4 00	MG/L	
GW_PPMON	41691	GW01549WC	WQPL	TOTAL SUSPENDED SOLIDS	663 00	5 00	MG/L	
GW_PPMON	41691	GW00440WC	WQPL	TOTAL SUSPENDED SOLIDS	860 00	4 00	MG/L	
GW_PPMON	41691	GW03806IT	WQPL	TOTAL SUSPENDED SOLIDS	910 00	4 00	MG/L	
GW_PPMON	41691	GW00291GA	WQPL	TOTAL SUSPENDED SOLIDS	1200 00	4 00	MG/L	
GW_PPMON	41691	GW00275GA	WQPL	TOTAL SUSPENDED SOLIDS	1500 00	4 00	MG/L	
GW_PPMON	41691	GW01010WC	WQPL	TOTAL SUSPENDED SOLIDS	1600 00	4 00	MG/L	
EMAD	41691	GW02615IT	WQPL	TOTAL SUSPENDED SOLIDS	1700 00	4 00	MG/L	
GW_PPMON	41691	GW00274GA	WQPL	TOTAL SUSPENDED SOLIDS	1860 00	5 00	MG/L	
GW_PPMON	41691	GW03396IT	WQPL	TOTAL SUSPENDED SOLIDS	2240 00	5 00	MG/L	
GW_PPMON	41691	GW00248GA	WQPL	TOTAL SUSPENDED SOLIDS	3000 00	4 00	MG/L	
EMAD	41691	GW02953IT	WQPL	TOTAL SUSPENDED SOLIDS	3300 00	5 00	MG/L	
GW_PPMON	41691	GW00290GA	WQPL	TOTAL SUSPENDED SOLIDS	5200 00	4 00	MG/L	
EMAD	41691	GW02090IT	WQPL	TOTAL SUSPENDED SOLIDS	7000 00	4 00	MG/L	
EMAD	4287	GW02672IT	WQPL	TOTAL SUSPENDED SOLIDS	88 00	4 00	MG/L	
EMAD	4287	GW02246IT	WQPL	TOTAL SUSPENDED SOLIDS	95 00	4 00	MG/L	
EMAD	4287	GW01231IT	WQPL	TOTAL SUSPENDED SOLIDS	140 00	4 00	MG/L	
GW_PPMON	4287	GW00031GA	WQPL	TOTAL SUSPENDED SOLIDS	175 00	5 00	MG/L	
GW_PPMON	4287	GW00122WC	WQPL	TOTAL SUSPENDED SOLIDS	310 00	4 00	MG/L	
GW_PPMON	4287	GW00548WC	WQPL	TOTAL SUSPENDED SOLIDS	320 00	5 00	MG/L	
EMAD	7087	GW02776IT	WQPL	TOTAL SUSPENDED SOLIDS	250 00	4 00	MG/L	
GW_PPMON	7087	GW03608IT	WQPL	TOTAL SUSPENDED SOLIDS	420 00	5 00	MG/L	
GW_PPMON	7087	GW00037GA	WQPL	TOTAL SUSPENDED SOLIDS	480 00	4 00	MG/L	
EMAD	7087	GW01540IT	WQPL	TOTAL SUSPENDED SOLIDS	600 00	4 00	MG/L	
EMAD	7087	GW01957IT	WQPL	TOTAL SUSPENDED SOLIDS	700 00	4 00	MG/L	
GW_PPMON	7087	GW01117WC	WQPL	TOTAL SUSPENDED SOLIDS	836 00	5 00	MG/L	
GW_PPMON	7087	GW00523WC	WQPL	TOTAL SUSPENDED SOLIDS	1100 00	5 00	MG/L	
EMAD	7087	GW02303IT	WQPL	TOTAL SUSPENDED SOLIDS	1100 00	4 00	MG/L	
EMAD	7087	GW03094IT	WQPL	TOTAL SUSPENDED SOLIDS	1200 00	4 00	MG/L	

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GW_PPMON	7187	GW01434WC	WQPL	TOTAL SUSPENDE SOLIDS	16 00	4 00	MG/L	
EMAD	7187	GW02279IT	WQPL	TOTAL SUSPENDE SOLIDS	18 50	4 00	MG/L	
123456	7187	GW00903IT	WQPL	TOTAL SUSPENDE SOLIDS	26 00	4 00	MG/L	
EMAD	7187	GW02681IT	WQPL	TOTAL SUSPENDE SOLIDS	26 00	4 00	MG/L	
GW_PPMON	7187	GW00091WC	WQPL	TOTAL SUSPENDE SOLIDS	45 50	4 00	MG/L	
GW_PPMON	7187	GW03580IT	WQPL	TOTAL SUSPENDE SOLIDS	51 00	5 00	MG/L	
EMAD	7187	GW01541IT	WQPL	TOTAL SUSPENDE SOLIDS	53 00	4 00	MG/L	
123456	7187	GW01183IT	WQPL	TOTAL SUSPENDE SOLIDS	57 00	4 00	MG/L	
GW_PPMON	7187	GW00502WC	WQPL	TOTAL SUSPENDE SOLIDS	79 50	4 00	MG/L	
EMAD	7187	GW03148IT	WQPL	TOTAL SUSPENDE SOLIDS	92 00	4 00	MG/L	
EMAD	7187	GW01886IT	WQPL	TOTAL SUSPENDE SOLIDS	97 00	4 00	MG/L	
GW_PPMON	7187	GW01094WC	WQPL	TOTAL SUSPENDE SOLIDS	227 00	5 00	MG/L	
EMAD	7287	GW01524IT	WQPL	TOTAL SUSPENDE SOLIDS	360 00	4 00	MG/L	
123456	7287	GW00944IT	WQPL	TOTAL SUSPENDE SOLIDS	580 00	4 00	MG/L	
GW_PPMON	7287	GW03604IT	WQPL	TOTAL SUSPENDE SOLIDS	619 00	5 00	MG/L	
123456	7287	GW01212IT	WQPL	TOTAL SUSPENDE SOLIDS	640 00	4 00	MG/L	
EMAD	7287	GW02783IT	WQPL	TOTAL SUSPENDE SOLIDS	1800 00	4 00	MG/L	
EMAD	7287	GW02309IT	WQPL	TOTAL SUSPENDE SOLIDS	1800 00	4 00	MG/L	
GW_PPMON	7287	GW00519WC	WQPL	TOTAL SUSPENDE SOLIDS	2500 00	4 00	MG/L	
EMAD	7287	GW03089IT	WQPL	TOTAL SUSPENDE SOLIDS	3000 00	4 00	MG/L	
GW_PPMON	7287	GW01391WC	WQPL	TOTAL SUSPENDE SOLIDS	5000 00	4 00	MG/L	
GW_PPMON	7287	GW01113WC	WQPL	TOTAL SUSPENDE SOLIDS	9382 00	5 00	MG/L	
GW_PPMON	7287	GW00113WC	WQPL	TOTAL SUSPENDE SOLIDS	17000 00	5 00	MG/L	
GW_PPMON	B206489	GW00116WC	WQPL	TOTAL SUSPENDE SOLIDS	9 00	5 00	MG/L	
EMAD	B206489	GW03246IT	WQPL	TOTAL SUSPENDE SOLIDS	9 00	4 00	MG/L	
EMAD	B206489	GW02310IT	WQPL	TOTAL SUSPENDE SOLIDS	14 00	4 00	MG/L	
EMAD	B206489	GW01525IT	WQPL	TOTAL SUSPENDE SOLIDS	19 00	4 00	MG/L	
EMAD	B206489	GW01959IT	WQPL	TOTAL SUSPENDE SOLIDS	20 00	4 00	MG/L	
EMAD	B206489	GW02720IT	WQPL	TOTAL SUSPENDE SOLIDS	21 00	4 00	MG/L	
GW_PPMON	B206489	GW00522WC	WQPL	TOTAL SUSPENDE SOLIDS	31 00	4 00	MG/L	
123456	B206489	GW00956IT	WQPL	TOTAL SUSPENDE SOLIDS	81 00	5 00	MG/L	
GW_PPMON	B206589	GW00038GA	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206589	GW02311IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	
EMAD	B206589	GW03091IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206589	GW02721IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
GW_PPMON	B206589	GW01118WC	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206589	GW01961IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
GW_PPMON	B206589	GW01406WC	WQPL	TOTAL SUSPENDE SOLIDS	5 00	4 00	MG/L	
GW_PPMON	B206589	GW00118WC	WQPL	TOTAL SUSPENDE SOLIDS	5 00	5 00	MG/L	U
GW_PPMON	B206589	GW03609IT	WQPL	TOTAL SUSPENDE SOLIDS	5 00	5 00	MG/L	U
123456	B206589	GW00943IT	WQPL	TOTAL SUSPENDE SOLIDS	8 00	5 00	MG/L	
GW_PPMON	B206589	GW00524WC	WQPL	TOTAL SUSPENDE SOLIDS	35 00	4 00	MG/L	
EMAD	B206589	GW01526IT	WQPL	TOTAL SUSPENDE SOLIDS	340 00	4 00	MG/L	
EMAD	B206689	GW02722IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206689	GW01527IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206689	GW03092IT	WQPL	TOTAL SUSPENDE SOLIDS	4 00	4 00	MG/L	U
EMAD	B206689	GW01962IT	WQPL	TOTAL SUSPENDE SOLIDS	5 00	4 00	MG/L	
EMAD	B206689	GW02312IT	WQPL	TOTAL SUSPENDE SOLIDS	5 00	4 00	MG/L	
GW_PPMON	B206689	GW03610IT	WQPL	TOTAL SUSPENDE SOLIDS	5 00	5 00	MG/L	U

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123456	B206689	GW00953IT	WQPL	TOTAL SUSPENDED SOLIDS	6 00	5 00	MG/L	
GW PPMON	B206689	GW01407WC	WQPL	TOTAL SUSPENDED SOLIDS	6 80	5 00	MG/L	U
GW PPMON	B206689	GW00040GA	WQPL	TOTAL SUSPENDED SOLIDS	9 00	4 00	MG/L	
GW PPMON	B206689	GW01119WC	WQPL	TOTAL SUSPENDED SOLIDS	9 00	5 00	MG/L	U
GW PPMON	B206689	GW00119WC	WQPL	TOTAL SUSPENDED SOLIDS	11 00	4 00	MG/L	
GW PPMON	B206689	GW00525WC	WQPL	TOTAL SUSPENDED SOLIDS	23 00	5 00	MG/L	
123456	B206889	GW00951IT	WQPL	TOTAL SUSPENDED SOLIDS	29 00	5 00	MG/L	
GW PPMON	B206889	GW00527WC	WQPL	TOTAL SUSPENDED SOLIDS	29 00	4 00	MG/L	
EMAD	B208089	GW01472IT	WQPL	TOTAL SUSPENDED SOLIDS	6 00	4 00	MG/L	
GW PPMON	B208089	GW01128WC	WQPL	TOTAL SUSPENDED SOLIDS	15 00	4 00	MG/L	
EMAD	B208089	GW01820IT	WQPL	TOTAL SUSPENDED SOLIDS	21 00	4 00	MG/L	
GW PPMON	B208089	GW00558WC	WQPL	TOTAL SUSPENDED SOLIDS	22 00	4 00	MG/L	
EMAD	B208089	GW03133IT	WQPL	TOTAL SUSPENDED SOLIDS	24 00	4 00	MG/L	
EMAD	B208089	GW02197IT	WQPL	TOTAL SUSPENDED SOLIDS	28 00	4 00	MG/L	
GW PPMON	B208089	GW03632IT	WQPL	TOTAL SUSPENDED SOLIDS	43 00	5 00	MG/L	
EMAD	B208089	GW02635IT	WQPL	TOTAL SUSPENDED SOLIDS	54 00	4 00	MG/L	
EMAD	B208589	GW02227IT	WQPL	TOTAL SUSPENDED SOLIDS	10 00	4 00	MG/L	
EMAD	B208589	GW02654IT	WQPL	TOTAL SUSPENDED SOLIDS	22 00	4 00	MG/L	
GW PPMON	B208789	GW03623IT	WQPL	TOTAL SUSPENDED SOLIDS	5 00	5 00	MG/L	U
EMAD	B208789	GW03132IT	WQPL	TOTAL SUSPENDED SOLIDS	8 00	4 00	MG/L	
EMAD	B208789	GW02638IT	WQPL	TOTAL SUSPENDED SOLIDS	9 00	4 00	MG/L	
EMAD	B208789	GW02208IT	WQPL	TOTAL SUSPENDED SOLIDS	21 00	4 00	MG/L	
GW PPMON	B210489	GW03639IT	WQPL	TOTAL SUSPENDED SOLIDS	5 00	5 00	MG/L	U
GW PPMON	B210489	GW00045GA	WQPL	TOTAL SUSPENDED SOLIDS	7 00	4 00	MG/L	
GW PPMON	B210489	GW00637WC	WQPL	TOTAL SUSPENDED SOLIDS	7 00	5 00	MG/L	
GW PPMON	B210489	GW01420WC	WQPL	TOTAL SUSPENDED SOLIDS	12 00	4 00	MG/L	
GW PPMON	B210489	GW00144WC	WQPL	TOTAL SUSPENDED SOLIDS	13 00	5 00	MG/L	
EMAD	B210489	GW01883IT	WQPL	TOTAL SUSPENDED SOLIDS	20 00	4 00	MG/L	
EMAD	B210489	GW02655IT	WQPL	TOTAL SUSPENDED SOLIDS	34 00	4 00	MG/L	
EMAD	B210489	GW03185IT	WQPL	TOTAL SUSPENDED SOLIDS	44 00	4 00	MG/L	
EMAD	B210489	GW02228IT	WQPL	TOTAL SUSPENDED SOLIDS	66 00	4 00	MG/L	
GW PPMON	B210489	GW01131WC	WQPL	TOTAL SUSPENDED SOLIDS	102 00	5 00	MG/L	
EMAD	B210489	GW01516IT	WQPL	TOTAL SUSPENDED SOLIDS	1200 00	4 00	MG/L	
GW PPMON	P209789	GW00493WC	WQPL	TOTAL SUSPENDED SOLIDS	5 00	5 00	MG/L	U
GW PPMON	P209789	GW01379WC	WQPL	TOTAL SUSPENDED SOLIDS	5 00	4 00	MG/L	
GW PPMON	P209789	GW00021WC	WQPL	TOTAL SUSPENDED SOLIDS	8 00	5 00	MG/L	
EMAD	P209789	GW02789IT	WQPL	TOTAL SUSPENDED SOLIDS	12 00	4 00	MG/L	
EMAD	P209789	GW03186IT	WQPL	TOTAL SUSPENDED SOLIDS	14 00	4 00	MG/L	
EMAD	P209789	GW01837IT	WQPL	TOTAL SUSPENDED SOLIDS	15 00	4 00	MG/L	
EMAD	P209789	GW01610IT	WQPL	TOTAL SUSPENDED SOLIDS	26 00	4 00	MG/L	
GW PPMON	P209789	GW03551IT	WQPL	TOTAL SUSPENDED SOLIDS	54 50	5 00	MG/L	
GW PPMON	P209789	GW01048WC	WQPL	TOTAL SUSPENDED SOLIDS	81 00	4 00	MG/L	
123456	P209789	GW01025IT	WQPL	TOTAL SUSPENDED SOLIDS	140 00	4 00	MG/L	
EMAD	P209789	GW02239IT	WQPL	TOTAL SUSPENDED SOLIDS	420 00	4 00	MG/L	
GW PPMON	P218389	GW01522WC	WQPL	TOTAL SUSPENDED SOLIDS	224 00	5 00	MG/L	
GW PPMON	P219489	GW01523WC	WQPL	TOTAL SUSPENDED SOLIDS	52 00	5 00	MG/L	

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QUAL_W	CHEM_COMME	QAQCTYP	DATE_LOAD	DATE_ANALY	DATE_SA	N16
	V, , 25 AUG 93 242935 ,	TRG	11/2/93 08 59 2		3/22/93	
	V ,,,, ,05 OCT 93, 261184	TRG	11/2/93 08 59 2		4/21/93	
	V,,,,,,25 AUG 93, 242936	TRG	11/2/93 08 59 2		3/22/93	
	V,, , 05 OCT 93 261185	TRG	11/2/93 08 59 2		4/21/93	
V	14 MAR 94,,,TRG,,,3496514	REAL	3/31/94 20 42 0	12/6/93 00 00 00	11/30/93	
V	18 SEP 92,,,,,TRG,,,1494328	REAL	3/31/94 20 42 0	5/19/92 00 00 00	5/14/92	
JA	05 OCT 93 1,,,TRG ,2615640	REAL	3/31/94 20 42 0	5/12/93 00 00 00	5/4/93	
V	08 JUL 92,,,,,TRG,,,168837	REAL	3/31/94 20 42 0	3/3/92 00 00 00	2/27/92	
V	10 MAR 94 ,TR1, 3468322	REAL	3/31/94 20 42 0	9/4/93 00 00 00	8/30/93	
V	11 AUG 93 , ,TRG ,2335934	REAL	3/31/94 20 42 0	3/1/93 00 00 00	2/22/93	
V	16 MAR 94 , ,TRG ,1720723	REAL	3/31/94 20 42 0	8/6/92 00 00 00	8/3/92	
V	01 APR 92 , ,TRG,,,1131281	REAL	3/31/94 20 42 0	12/23/91 00 00 0	12/19/91	
V	04 MAR 93,,,,,TRG,,,1897507	REAL	3/31/94 20 42 0	11/12/92 00 00 0	11/9/92	
V	17 JUL 92, ,TRG,,,1317696	REAL	3/31/94 20 42 0	4/7/92 00 00 00	4/1/92	
	,,,,,TRG,,,1520324	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92	
V	07 APR 93 ,,,,TRG,,,2043068	REAL	3/31/94 20 42 0	11/21/92 00 00 0	11/18/92	
V	01 FEB 92,,,,,TRG,,,1080045	REAL	3/31/94 20 42 0	6/24/91 00 00 00	6/20/91	
V	16 MAR 94,,,,,TRG,,,1873337	REAL	3/31/94 20 42 0	9/22/92 00 00 00	9/15/92	
V	01 FEB 92 , ,TRG ,1101812	REAL	3/31/94 20 42 0	9/17/91 00 00 00	9/12/91	
V	01 APR 92 TRG ,120112	REAL	3/31/94 20 42 0	11/20/91 00 00 0	11/14/91	
V	11 SEP 93 TRG 2521598	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/15/93	
V	29 MAY 92, TRG 1356417	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/18/91	
V	24 AUG 92,,,TRG,,,1450682	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/23/92	
V	17 JUL 92,,,,,TRG,,,1378910	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	20 NOV 92, , ,TRG,,,1579684	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/16/92	
V	29 MAY 92,,,,,TRG,,,1356418	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/19/91	
V	04 MAR 93,,,,,TRG,,,1944374	REAL	3/31/94 20 42 0	10/12/92 00 00 0	10/7/92	
V	01 FEB 92,,,,,TRG,,,1123176	REAL	3/31/94 20 42 0	10/22/91 00 00 0	10/15/91	
V	16 MAR 94,, ,TRG ,7144	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/21/92	
V	01 FEB 92,, ,TRG,,,1079008	REAL	3/31/94 20 42 0	5/7/91 00 00 00	5/2/91	
	, TRG, ,1079424	REAL	3/31/94 20 42 0	3/25/91 00 00 00	3/18/91	
V	17 JUL 92 , ,TRG ,1378907	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/14/92	
V	20 NOV 92 , ,TRG 1579679	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/14/92	
V	16 MAR 94, , ,TRG,,,7145	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/20/92	
V	20 NOV 92,,,,,TRG,,,1579673	REAL	3/31/94 20 42 0	7/16/92 00 00 00	7/13/92	
V	17 JUL 92, , ,TRG ,1378912	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	20 NOV 92,,,,,TRG,,,1711849	REAL	3/31/94 20 42 0	8/4/92 00 00 00	7/30/92	
V	01 FEB 92, , TRG,,,1078360	REAL	3/31/94 20 42 0	4/29/91 00 00 00	4/24/91	
V	11 SEP 93,,,,,TRG,,,2521638	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/13/93	
V	17 JUL 92 ,TRG, 1378909	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	30 JUL 93 , ,TRG,, 2267170	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93	
V	10 MAR 94 TR1 3470186	REAL	3/31/94 20 42 0	10/31/93 00 00 0	10/28/93	
	TRG 1078978	REAL	3/31/94 20 42 0	3/21/91 00 00 00	3/15/91	
	,,,TRG ,1079089	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91	
V	01 FEB 92 , ,TRG,,,1124536	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/22/91	
Y	,,,TRG,,,3619659	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94	
V	16 MAR 94,,, TRG ,5163	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92	
V	04 MAR 93 , ,TRG 1944291	REAL	3/31/94 20 42 0	10/17/92 00 00 0	10/13/92	

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V	19 OCT 93 , , , TRG , , , 2795418	REAL	3/31/94 20 42 0	8/6/93 00 00 00	8/4/93
V	16 MAR 94 , , , TRG , , , 1921848	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/7/92
V	11 SEP 93 , TRG 2521628	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/13/93
V	01 FEB 92 , , TRG , , 1124528	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/21/91
V	17 JUL 92 , , , TRG , , 1378902	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/13/92
	TRG , 1078450	REAL	3/31/94 20 42 0	7/15/91 00 00 00	7/11/91
V	01 FEB 92 , , , TRG , , 1078446	REAL	3/31/94 20 42 0	4/22/91 00 00 00	4/18/91
V	16 MAR 94 , , TRG , , 7130	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/15/92
V	22 FEB 94 , , , TRG , , 3384681	REAL	3/31/94 20 42 0	10/25/93 00 00 0	10/20/93
V	06 JUL 93 , , , TRG , , 2216378	REAL	3/31/94 20 42 0	2/11/93 00 00 00	2/5/93
V	20 NOV 92 , , , TRG , , 1579689	REAL	3/31/94 20 42 0	7/23/92 00 00 00	7/16/92
V	10 MAR 94 , , , TR1 , , 3457436	REAL	3/31/94 20 42 0	8/9/93 00 00 00	8/2/93
	, , TRG , , 1079890	REAL	3/31/94 20 42 0	3/12/91 00 00 00	3/4/91
V	01 FEB 92 TRG , , 1078402	REAL	3/31/94 20 42 0	4/22/91 00 00 00	4/18/91
V	10 MAR 94 TR1 , , 3457438	REAL	3/31/94 20 42 0	8/9/93 00 00 00	8/2/93
V	01 FEB 92 , , , TRG , , 1122350	REAL	3/31/94 20 42 0	10/17/91 00 00 0	10/10/91
V	01 FEB 92 , , TRG , , 1078462	REAL	3/31/94 20 42 0	3/11/91 00 00 00	3/4/91
V	17 JUL 92 , , , TRG , , 1376889	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/7/92
V	03 MAR 94 , , TRG , , 3423702	REAL	3/31/94 20 42 0	11/1/93 00 00 00	10/29/93
V	16 MAR 94 , , , TRG , , 1921905	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/7/92
	, , , TRG , , 1078846	REAL	3/31/94 20 42 0	7/12/91 00 00 00	7/9/91
V	20 NOV 92 , , , TRG , , 1711842	REAL	3/31/94 20 42 0	7/30/92 00 00 00	7/27/92
V	16 MAR 94 , , , TRG , , 5152	REAL	3/31/94 20 42 0	1/14/92 00 00 00	1/9/92
	, , , TRG , , 2486832	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/16/93
V	30 JUL 93 , , , TRG , , 2267126	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/1/93
V	16 MAR 94 , , , TRG , , 1872647	REAL	3/31/94 20 42 0	8/11/92 00 00 00	8/5/92
V	28 FEB 94 , , , TRG , , 3415348	REAL	3/31/94 20 42 0	9/27/93 00 00 00	9/22/93
Y	, , , TRG , , 3529725	REAL	3/31/94 20 42 0	12/16/93 00 00 0	12/13/93
	, , , TRG , , 1079677	REAL	3/31/94 20 42 0	7/12/91 00 00 00	7/9/91
V	17 JUL 92 , , TRG , , 1376886	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/7/92
V	13 OCT 93 , , , TRG , , 2670220	REAL	3/31/94 20 42 0	5/12/93 00 00 00	5/6/93
V	25 AUG 93 , , , TRG , , 2313548	REAL	3/31/94 20 42 0	3/8/93 00 00 00	3/5/93
V	16 MAR 94 , , , TRG , , 5151	REAL	3/31/94 20 42 0	1/14/92 00 00 00	1/10/92
V	07 APR 93 , , TRG , , 2003312	REAL	3/31/94 20 42 0	12/15/92 00 00 0	12/10/92
	, , , TRG , , 1078443	REAL	3/31/94 20 42 0	3/21/91 00 00 00	3/14/91
V	01 FEB 92 , , , TRG , , 1122054	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/8/91
V	01 FEB 92 , , , TRG , , 1078636	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/29/91
V	17 JUL 92 , , , TRG , , 1376890	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/8/92
V	01 FEB 92 TRG , , 1079150	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/30/91
Y	, , , TRG , , 3529721	REAL	3/31/94 20 42 0	12/16/93 00 00 0	12/13/93
V	01 FEB 92 , , , TRG , , 1123175	REAL	3/31/94 20 42 0	10/22/91 00 00 0	10/15/91
	, , , TRG , , 1078877	REAL	3/31/94 20 42 0	3/25/91 00 00 00	3/19/91
V	17 FEB 93 , , , TRG , , 1856590	REAL	3/31/94 20 42 0	9/21/92 00 00 00	9/18/92
V	29 MAY 92 , , , TRG , , 1356414	REAL	3/31/94 20 42 0	7/19/91 00 00 00	7/17/91
V	17 JUL 92 , , , TRG , , 1378903	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/14/92
Y	, , , TRG , , 3640066	REAL	3/31/94 20 42 0	2/1/94 00 00 00	1/27/94
V	04 MAR 93 , , , TRG , , 1944239	REAL	3/31/94 20 42 0	10/17/92 00 00 0	10/13/92
V	28 FEB 94 , , TRG , , 3419774	REAL	3/31/94 20 42 0	9/29/93 00 00 00	9/23/93
V	01 FEB 92 , TRG , , 1079755	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/30/91

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V	25 AUG 93,, TRG 2336074	REAL	3/31/94 20 42 0	3/6/93 00 00 00	3/2/93
V	17 JUL 92, , TRG ,1378900	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/13/92
V	01 FEB 92, TRG ,1079418	REAL	3/31/94 20 42 0	5/9/91 00 00 00	5/6/91
V	11 SEP 93 ,,,,TRG,,2521608	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/14/93
V	24 AUG 92,, ,TRG ,,1452171	REAL	3/31/94 20 42 0	5/4/92 00 00 00	4/28/92
	,,,TRG,,,1079075	REAL	3/31/94 20 42 0	7/19/91 00 00 00	7/17/91
V	05 OCT 93,,,,TRG,,,2611788	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/20/93
V	16 MAR 94,,,, TRG ,164766	REAL	3/31/94 20 42 0	2/27/92 00 00 00	2/21/92
V	06 JAN 94 TRG,, 2862052	REAL	3/31/94 20 42 0	9/21/93 00 00 00	9/16/93
V	05 OCT 93, TRG,, 2615849	REAL	3/31/94 20 42 0	5/17/93 00 00 00	5/11/93
Y	, ,TR1 ,,3527530	REAL	3/31/94 20 42 0	11/13/93 00 00 0	11/8/93
V	19 OCT 93,,,, TRG,,,2814569	REAL	3/31/94 20 42 0	8/17/93 00 00 00	8/13/93
	,,,TRG,,,1520322	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92
V	06 JUL 93,, ,TRG ,,2222130	REAL	3/31/94 20 42 0	2/23/93 00 00 00	2/18/93
V	08 JUL 92,, TRG,,,1272245	REAL	3/31/94 20 42 0	3/23/92 00 00 00	3/17/92
V	16 MAR 94,,,, TRG ,,1919246	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/9/92
V	01 APR 92,,,,TRG,,,1131285	REAL	3/31/94 20 42 0	12/27/91 00 00 0	12/20/91
V	20 NOV 92, ,,,TRG,,,1586379	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/22/92
Y	,,,TRG,, 3643612	REAL	3/31/94 20 42 0	2/21/94 00 00 00	2/16/94
V	10 MAR 94 , TR1 3467809	REAL	3/31/94 20 42 0	9/24/93 00 00 00	9/20/93
Y	TRG 3687540	REAL	3/31/94 20 42 0	3/9/94 00 00 00	3/3/94
Y	TR1 3578869	REAL	3/31/94 20 42 0	12/13/93 00 00 0	12/9/93
V	25 AUG 93 ,TRG, 2294789	REAL	3/31/94 20 42 0	3/22/93 00 00 00	3/17/93
V	07 APR 93,,,,TRG,,,1997959	REAL	3/31/94 20 42 0	11/24/92 00 00 0	11/18/92
Y	,,,TRG,,,3675113	REAL	3/31/94 20 42 0	3/2/94 00 00 00	2/24/94
Y	,,, TRG ,3643614	REAL	3/31/94 20 42 0	2/23/94 00 00 00	2/18/94
V	15 SEP 93, TRG,,,2719688	REAL	3/31/94 20 42 0	6/25/93 00 00 00	6/22/93
V	17 JUL 92,,,,TRG,,,1317697	REAL	3/31/94 20 42 0	4/7/92 00 00 00	4/1/92
Y	,,,TRG,,,3687247	REAL	3/31/94 20 42 0	2/23/94 00 00 00	2/18/94
V	17 FEB 93,,,,TRG,,,1856030	REAL	3/31/94 20 42 0	9/21/92 00 00 00	9/16/92
Y	,,,TRG,,,3643613	REAL	3/31/94 20 42 0	2/21/94 00 00 00	2/16/94
	,TRG 1520323	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92
Y	,TRG 3668469	REAL	3/31/94 20 42 0	2/25/94 00 00 00	2/21/94
V	27 APR 92 ,,, TRG ,1127477	REAL	3/31/94 20 42 0	12/12/91 00 00 0	12/7/91
V	24 AUG 92,,,,TRG,,,1450676	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/21/92
V	16 MAR 94,,,,TRG,,,7138	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/16/92
V	01 FEB 92, , ,TRG,,,1078501	REAL	3/31/94 20 42 0	5/7/91 00 00 00	5/3/91
Y	,,,TR1,,,3674421	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/18/94
V	06 JUL 93 ,,,,TRG ,,2222129	REAL	3/31/94 20 42 0	2/23/93 00 00 00	2/17/93
V	05 OCT 93,,,, TRG,,,2615840	REAL	3/31/94 20 42 0	5/17/93 00 00 00	5/11/93
V	17 SEP 92 , TRG ,,1453515	REAL	3/31/94 20 42 0	5/4/92 00 00 00	4/28/92
V	04 MAR 93,,,,TRG,,,1944522	REAL	3/31/94 20 42 0	10/9/92 00 00 00	10/6/92
Y	TRG 3619656	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
V	29 MAY 92 TRG 1356424	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/19/91
V	01 FEB 92 TRG 1125638	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	10 MAR 94,,,,TR1,,,3458186	REAL	3/31/94 20 42 0	8/13/93 00 00 00	8/10/93
V	11 SEP 93,,,,TRG,,,2521544	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/12/93
V	16 MAR 94 ,,,TRG ,,160800	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/21/92
V	20 NOV 92 TRG ,1586386	REAL	3/31/94 20 42 0	7/29/92 00 00 00	7/23/92

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V	01 MAR 94 ,TRG,,,3427301	REAL	3/31/94 20 42 0	11/9/93 00 00 00	11/3/93 •
V	16 MAR 94,,,,TRG,,,7133	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/16/92 •
	,,,TRG,, 1078940	REAL	3/31/94 20 42 0	3/12/91 00 00 00	3/4/91
V	24 AUG 92 , ,TRG,,,1450670	REAL	3/31/94 20 42 0	4/22/92 00 00 00	4/20/92 •
V	06 JUL 93 , TRG, 2260564	REAL	3/31/94 20 42 0	2/25/93 00 00 00	2/19/93 •
V	16 MAR 94, ,TRG,,1919700	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/9/92 •
V	29 MAY 92, TRG,,1356416	REAL	3/31/94 20 42 0	7/19/91 00 00 00	7/17/91
V	01 FEB 92,,,,TRG,,,1079690	REAL	3/31/94 20 42 0	4/25/91 00 00 00	4/22/91
V	03 MAR 94,,,,TRG,,,2461862	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/9/93 •
V	20 NOV 92,,, TRG ,1587773	REAL	3/31/94 20 42 0	7/29/92 00 00 00	7/22/92
V	01 FEB 92 ,,,TRG,,,1122341	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/9/91
V	10 MAR 94 ,,,TR1,,,3458175	REAL	3/31/94 20 42 0	8/13/93 00 00 00	8/11/93 •
	,,,,TRG, ,1079133	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/15/91
	,,,TRG,,,1079700	REAL	3/31/94 20 42 0	3/21/91 00 00 00	3/11/91
V	16 MAR 94, TRG,,1921813	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/7/92
V	01 FEB 92 , TRG, 1079781	REAL	3/31/94 20 42 0	4/25/91 00 00 00	4/23/91
V	24 AUG 92,,,,TRG , 1450689	REAL	3/31/94 20 42 0	4/29/92 00 00 00	4/23/92
V	16 MAR 94 , ,TRG,, 160791	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/20/92
V	03 MAR 94,,,,TRG ,2461861	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/8/93
V	25 SEP 92,,,,TRG,,,1552787	REAL	3/31/94 20 42 0	7/13/92 00 00 00	7/7/92
V	22 FEB 94, ,,,TRG,,,3384679	REAL	3/31/94 20 42.0	10/20/93 00 00 0	10/13/93
V	10 MAR 94,,,,TR1,,,3458184	REAL	3/31/94 20 42 0	8/13/93 00 00 00	8/9/93
V	30 JUL 93,,, TRG,,2267137	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/1/93
V	30 JUL 93,,,,TRG,,,2267180	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	20 NOV 92,,,,TRG,,,1711850	REAL	3/31/94 20 42 0	8/4/92 00 00 00	7/30/92
V	16 MAR 94,,,,TRG, 160792	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/20/92
	,,, TRG 1078685	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	01 FEB 92, TRG ,1125639	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	17 JUL 92,,, ,TRG 1381487	REAL	3/31/94 20 42 0	4/22/92 00 00 00	4/16/92
V	03 MAR 94,,,,TRG,,,2461871	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/8/93
JA	29 MAY 92,13,,,TRG,,,1734727	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
Y	,, TRG,,,3619662	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
V	08 JUL 92,,,,TRG,,,89304	REAL	3/31/94 20 42 0	2/10/92 00 00 00	2/7/92
V	22 NOV 92,,,, TRG,,,1555935	REAL	3/31/94 20 42 0	7/16/92 00 00 00	7/14/92
V	24 AUG 92,, , TRG,,1452406	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/21/92
V	19 OCT 93, TRG,,2795425	REAL	3/31/94 20 42 0	8/17/93 00 00 00	8/12/93
V	01 FEB 92,,,,TRG,,,1125641	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	01 MAR 94, TRG,,,3427310	REAL	3/31/94 20 42 0	11/9/93 00 00 00	11/5/93
V	30 JUL 93,, TRG,, 2267195	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	04 MAR 93,,,,TRG,,1944461	REAL	3/31/94 20 42 0	10/9/92 00 00 00	10/6/92
JA	29 MAY 92,13,,,TRG,,,1773079	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
	,,,,TRG,,,2486829	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/16/93
	,,,,TRG,,,1079102	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	24 AUG 92,,,,TRG,,,1450685	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/23/92
	,TRG 1079288	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	20 NOV 92 ,,,TRG,,,1579683	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/16/92
V	01 FEB 92,, TRG 1125642	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	16 MAR 94, TRG 164777	REAL	3/31/94 20 42 0	2/27/92 00 00 00	2/22/92
V	04 MAR 93 TRG 1944451	REAL	3/31/94 20 42 0	10/9/92 00 00 00	10/6/92

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JA	29 MAY 92 13, , TRG,, 1734719	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
V	10 MAR 94,52 , ,TR1,,,3470017	REAL	3/31/94 20 42 0	10/23/93 00 00 0	10/18/93
Y	TRG 3629843	REAL	3/31/94 20 42 0	2/1/94 00 00 00	1/25/94
JA	10 MAR 94,7,,,TR1,,,3458187	REAL	3/31/94 20 42 0	8/13/93 00 00 00	8/10/93
V	06 JUL 93,,,,,TRG,,,2222121	REAL	3/31/94 20 42 0	2/17/93 00 00 00	2/11/93
V	05 OCT 93, ,,,TRG,,,2611824	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/21/93
JA	01 FEB 92 1, ,,,TRG,,,1102570	REAL	3/31/94 20 42 0	3/22/91 00 00 00	3/12/91
V	11 SEP 93,,,,,TRG,,,2484805	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/22/93
	, ,,,TRG,, 1079726	REAL	3/31/94 20 42 0	7/15/91 00 00 00	7/10/91
V	19 OCT 93 ,,,TRG 2808750	REAL	3/31/94 20 42 0	8/3/93 00 00 00	7/28/93
V	01 FEB 92 ,,,TRG,,,1122056	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/8/91
V	11 SEP 93 TRG 2484807	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/23/93
V	20 NOV 92,,,, TRG,,,1579680	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/15/92
V	16 MAR 94, ,TRG, ,5153	REAL	3/31/94 20 42 0	1/14/92 00 00 00	1/10/92
JA	04 MAR 93,51,,,,,TRG,,,1944468	REAL	3/31/94 20 42 0	10/9/92 00 00 00	10/6/92
V	17 JUL 92,,,,,TRG,,,1376902	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
V	16 MAR 94,,,,,TRG,,,5166	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92
V	17 JUL 92,,, TRG, 1376904	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
V	04 MAR 93,,,,,TRG,,,1944493	REAL	3/31/94 20 42 0	10/9/92 00 00 00	10/6/92
V	20 NOV 92,,,,,TRG,,,1581889	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/21/92
V	17 JUL 92 ,,, TRG,, 1376898	REAL	3/31/94 20 42.0	4/13/92 00 00 00	4/9/92
V	16 MAR 94, TRG ,5167	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92
V	16 MAR 94 TRG 1919371	REAL	3/31/94 20 42 0	10/13/92 00 00 0	10/8/92
Y	, ,,,TRG, 3619658	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
JA	05 OCT 93,1 ,TRG ,,,2611947	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/19/93
V	22 FEB 94 ,,,TRG,,,3384682	REAL	3/31/94 20 42 0	10/25/93 00 00 0	10/20/93
V	30 JUL 93,,,,,TRG,,,2267205	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	01 FEB 92,,,,,TRG,,,1124529	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/21/91
V	17 JUL 92,,, TRG,,,1378898	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
V	20 NOV 92,,,,,TRG,,,1581887	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/20/92
V	16 MAR 94,,, ,TRG,,,5161	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/13/92
V	10 MAR 94,,,,,TR1,, 3457441	REAL	3/31/94 20 42 0	8/9/93 00 00 00	8/4/93
	, ,,,TRG,,,1078404	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/15/91
V	11 SEP 93 TRG 2463337	REAL	3/31/94 20 42 0	4/12/93 00 00 00	4/6/93
V	22 FEB 94,,,,,TRG,,,3384674	REAL	3/31/94 20 42 0	10/20/93 00 00 0	10/15/93
V	06 JUL 93 ,,,TRG,,,2267273	REAL	3/31/94 20 42 0	2/12/93 00 00 00	2/9/93
V	24 AUG 92,,,,,TRG,,,1452165	REAL	3/31/94 20 42 0	4/29/92 00 00 00	4/24/92
V	20 NOV 92,,,,,TRG,,,1581888	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/20/92
V	01 FEB 92,,,,,TRG,,,1122354	REAL	3/31/94 20 42 0	10/17/91 00 00 0	10/11/91
	TRG 1124337	REAL	3/31/94 20 42 0	8/7/91 00 00 00	8/1/91
V	04 MAR 93, ,,,TRG,,,1959296	REAL	3/31/94 20 42 0	10/21/92 00 00 0	10/16/92
V	06 JAN 94,,,,,TRG,,,2765821	REAL	3/31/94 20 42 0	7/19/93 00 00 00	7/16/93
V	01 FEB 92,,, TRG, 1078500	REAL	3/31/94 20 42 0	4/1/91 00 00 00	3/26/91
V	16 MAR 94,,,,,TRG,,,7143	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/20/92
V	14 MAR 94 TR1 , 3520780	REAL	3/31/94 20 42 0	11/20/93 00 00 0	11/16/93
V	14 MAR 94, , TR1, ,3520781	REAL	3/31/94 20 42 0	11/20/93 00 00 0	11/16/93

TOTAL DISSOLVED SOLIDS BY WELL NUMBER

SITE	LOCATION	FIELDID	METHOD	ANALYTE	RESULT	REP_LIM	UNITS	QUAL_LA
165	76292	GW00533WC	WQPL	TOTAL DISSOLVED SOLIDS	380 00	14 00	MG/L	
165	76292	GW00467WC	WQPL	TOTAL DISSOLVED SOLIDS	430 00	14 00	MG/L	
143	77492	GW00534WC	WQPL	TOTAL DISSOLVED SOLIDS	740 00	14 00	MG/L	
143	77492	GW00469WC	WQPL	TOTAL DISSOLVED SOLIDS	760 00	14 00	MG/L	
EMAD	02691	GW02856IT	WQPL	TOTAL DISSOLVED SOLIDS	330 00	10 00	MG/L	
GW_PPMON	02691	GW01218WC	WQPL	TOTAL DISSOLVED SOLIDS	396 00	14 00	MG/L	
GW_PPMON	02691	GW01630WC	WQPL	TOTAL DISSOLVED SOLIDS	440 00	10 00	MG/L	
EMAD	02691	GW02513IT	WQPL	TOTAL DISSOLVED SOLIDS	440 00	10 00	MG/L	
GW_PPMON	02691	GW00693WC	WQPL	TOTAL DISSOLVED SOLIDS	440 00	14 00	MG/L	
GW_PPMON	02691	GW00260WC	WQPL	TOTAL DISSOLVED SOLIDS	450 00	14 00	MG/L	
EMAD	02691	GW02172IT	WQPL	TOTAL DISSOLVED SOLIDS	450 00	10 00	MG/L	
GW_PPMON	02691	GW03826IT	WQPL	TOTAL DISSOLVED SOLIDS	470 00	10 00	MG/L	
EMAD	02691	GW03215IT	WQPL	TOTAL DISSOLVED SOLIDS	500 00	10 00	MG/L	
GW_PPMON	0486	GW03391IT	WQPL	TOTAL DISSOLVED SOLIDS	350 00	14 00	MG/L	
EMAD	0486	GW01456IT	WQPL	TOTAL DISSOLVED SOLIDS	370 00	10 00	MG/L	
EMAD	0486	GW01763IT	WQPL	TOTAL DISSOLVED SOLIDS	370 00	10 00	MG/L	
EMAD	0486	GW02613IT	WQPL	TOTAL DISSOLVED SOLIDS	400 00	10 00	MG/L	
GW_PPMON	0486	GW03807IT	WQPL	TOTAL DISSOLVED SOLIDS	410 00	14 00	MG/L	
EMAD	0486	GW02027IT	WQPL	TOTAL DISSOLVED SOLIDS	440 00	10 00	MG/L	
EMAD	0486	GW02957IT	WQPL	TOTAL DISSOLVED SOLIDS	510 00	5 00	MG/L	
EMAD	0586	GW02670IT	WQPL	TOTAL DISSOLVED SOLIDS	4300 00	10 00	MG/L	
GW_PPMON	0586	GW00549WC	WQPL	TOTAL DISSOLVED SOLIDS	4700 00	14 00	MG/L	
EMAD	0586	GW01538IT	WQPL	TOTAL DISSOLVED SOLIDS	5100 00	10 00	MG/L	
EMAD	0686	GW02671IT	WQPL	TOTAL DISSOLVED SOLIDS	1900 00	10 00	MG/L	
EMAD	0686	GW03150IT	WQPL	TOTAL DISSOLVED SOLIDS	3600 00	10 00	MG/L	
GW_PPMON	1186	GW00998IT	WQPL	TOTAL DISSOLVED SOLIDS	490 00	10 00	MG/L	
EMAD	1186	GW02669IT	WQPL	TOTAL DISSOLVED SOLIDS	500 00	10 00	MG/L	
GW_PPMON	1186	GW01225IT	WQPL	TOTAL DISSOLVED SOLIDS	510 00	10 00	MG/L	
EMAD	1186	GW02242IT	WQPL	TOTAL DISSOLVED SOLIDS	520 00	10 00	MG/L	
GW_PPMON	1186	GW03618IT	WQPL	TOTAL DISSOLVED SOLIDS	530 00	14 00	MG/L	
EMAD	1186	GW01539IT	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
EMAD	1186	GW01902IT	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
EMAD	1186	GW03152IT	WQPL	TOTAL DISSOLVED SOLIDS	580 00	10 00	MG/L	
EMAD	1286	GW02677IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
EMAD	1286	GW03095IT	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
EMAD	1286	GW02245IT	WQPL	TOTAL DISSOLVED SOLIDS	1600 00	10 00	MG/L	
GW_PPMON	1386	GW03621IT	WQPL	TOTAL DISSOLVED SOLIDS	690 00	14 00	MG/L	
EMAD	1386	GW02659IT	WQPL	TOTAL DISSOLVED SOLIDS	690 00	10 00	MG/L	
123456	1386	GW01210IT	WQPL	TOTAL DISSOLVED SOLIDS	690 00	10 00	MG/L	
123456	1386	GW00972IT	WQPL	TOTAL DISSOLVED SOLIDS	690 00	10 00	MG/L	
GW_PPMON	1386	GW00046GA	WQPL	TOTAL DISSOLVED SOLIDS	700 00	10 00	MG/L	
EMAD	1386	GW02237IT	WQPL	TOTAL DISSOLVED SOLIDS	710 00	10 00	MG/L	
EMAD	1386	GW01880IT	WQPL	TOTAL DISSOLVED SOLIDS	720 00	10 00	MG/L	
GW_PPMON	1386	GW00562WC	WQPL	TOTAL DISSOLVED SOLIDS	740 00	14 00	MG/L	
GW_PPMON	1386	GW01421WC	WQPL	TOTAL DISSOLVED SOLIDS	751 00	14 00	MG/L	
EMAD	1386	GW03232IT	WQPL	TOTAL DISSOLVED SOLIDS	760 00	10 00	MG/L	
GW_PPMON	1386	GW01132WC	WQPL	TOTAL DISSOLVED SOLIDS	770 00	10 00	MG/L	
EMAD	1386	GW01482IT	WQPL	TOTAL DISSOLVED SOLIDS	770 00	10 00	MG/L	

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GW PPMON	1386	GW00145WC	WQPL	TOTAL DISSOLVED SOLIDS	780 00	14 00	MG/L	
EMAD	1586	GW02240IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
GW PPMON	1586	GW01120IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
GW PPMON	1586	GW00136WC	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
GW PPMON	1586	GW01125WC	WQPL	TOTAL DISSOLVED SOLIDS	1097 00	14 00	MG/L	
GW PPMON	1586	GW00904IT	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
GW PPMON	1586	GW01415WC	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
GW PPMON	1586	GW00555WC	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	14 00	MG/L	
GW PPMON	1586	GW03627IT	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
EMAD	1586	GW01882IT	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
EMAD	1586	GW02676IT	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
EMAD	1586	GW03182IT	WQPL	TOTAL DISSOLVED SOLIDS	1200 00	10 00	MG/L	
EMAD	1586	GW01509IT	WQPL	TOTAL DISSOLVED SOLIDS	1200 00	10 00	MG/L	
EMAD	1786	GW02640IT	WQPL	TOTAL DISSOLVED SOLIDS	3700 00	10 00	MG/L	
GW PPMON	1786	GW01416WC	WQPL	TOTAL DISSOLVED SOLIDS	3900 00	10 00	MG/L	
EMAD	1786	GW01878IT	WQPL	TOTAL DISSOLVED SOLIDS	4100 00	10 00	MG/L	
GW PPMON	1786	GW01127WC	WQPL	TOTAL DISSOLVED SOLIDS	4331 00	14 00	MG/L	
GW PPMON	1786	GW03630IT	WQPL	TOTAL DISSOLVED SOLIDS	4360 00	10 00	MG/L	
GW PPMON	1786	GW00138WC	WQPL	TOTAL DISSOLVED SOLIDS	4400 00	14 00	MG/L	
123456	1786	GW00905IT	WQPL	TOTAL DISSOLVED SOLIDS	4420 00		MG/L	
GW PPMON	1786	GW00557WC	WQPL	TOTAL DISSOLVED SOLIDS	4600 00	10 00	MG/L	
EMAD	1786	GW03190IT	WQPL	TOTAL DISSOLVED SOLIDS	4900 00	10 00	MG/L	
EMAD	1786	GW01474IT	WQPL	TOTAL DISSOLVED SOLIDS	5000 00	10 00	MG/L	
123456	1786	GW01116IT	WQPL	TOTAL DISSOLVED SOLIDS	5000 00	10 00	MG/L	
GW PPMON	3586	GW00262WC	WQPL	TOTAL DISSOLVED SOLIDS	810 00	10 00	MG/L	
GW PPMON	3586	GW01701WC	WQPL	TOTAL DISSOLVED SOLIDS	900 00	10 00	MG/L	
GW PPMON	3586	GW00695WC	WQPL	TOTAL DISSOLVED SOLIDS	900 00	10 00	MG/L	
GW PPMON	3586	GW01221IT	WQPL	TOTAL DISSOLVED SOLIDS	920 00	10 00	MG/L	
EMAD	3586	GW02195IT	WQPL	TOTAL DISSOLVED SOLIDS	920 00	10 00	MG/L	
GW PPMON	3586	GW01244WC	WQPL	TOTAL DISSOLVED SOLIDS	930 00	10 00	MG/L	
EMAD	3586	GW01461IT	WQPL	TOTAL DISSOLVED SOLIDS	950 00	10 00	MG/L	
GW PPMON	3586	GW03828IT	WQPL	TOTAL DISSOLVED SOLIDS	950 00	10 00	MG/L	
GW PPMON	3586	GW00976IT	WQPL	TOTAL DISSOLVED SOLIDS	950 00	10 00	MG/L	
EMAD	3586	GW01818IT	WQPL	TOTAL DISSOLVED SOLIDS	980 00	10 00	MG/L	
EMAD	3586	GW02631IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
EMAD	3586	GW03217IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	14 00	MG/L	
EMAD	3686	GW02632IT	WQPL	TOTAL DISSOLVED SOLIDS	1200 00	10 00	MG/L	
123456	3686	GW01222IT	WQPL	TOTAL DISSOLVED SOLIDS	1400 00	10 00	MG/L	
123456	3786	GW01223IT	WQPL	TOTAL DISSOLVED SOLIDS	1900 00	10 00	MG/L	
EMAD	3786	GW01899IT	WQPL	TOTAL DISSOLVED SOLIDS	1900 00	10 00	MG/L	
EMAD	3786	GW01521IT	WQPL	TOTAL DISSOLVED SOLIDS	2100 00	10 00	MG/L	
123456	3786	GW00995IT	WQPL	TOTAL DISSOLVED SOLIDS	2200 00	10 00	MG/L	
GW PPMON	3786	GW00155GA	WQPL	TOTAL DISSOLVED SOLIDS	2200 00	10 00	MG/L	
EMAD	3786	GW02656IT	WQPL	TOTAL DISSOLVED SOLIDS	2300 00	10 00	MG/L	
GW PPMON	3786	GW01685WC	WQPL	TOTAL DISSOLVED SOLIDS	2300 00	10 00	MG/L	
GW PPMON	3786	GW01362WC	WQPL	TOTAL DISSOLVED SOLIDS	2400 00	10 00	MG/L	
GW PPMON	3786	GW03233IT	WQPL	TOTAL DISSOLVED SOLIDS	2450 00	10 00	MG/L	
GW PPMON	3786	GW03641IT	WQPL	TOTAL DISSOLVED SOLIDS	2500 00	14 00	MG/L	
EMAD	3886	GW01224IT	WQPL	TOTAL DISSOLVED SOLIDS	1400 00	10 00	MG/L	

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GW PPMON	3886	GW00128WC	WQPL	TOTAL DISSOLVED SOLIDS	1600 00	14 00	MG/L	
EMAD	3886	GW02657IT	WQPL	TOTAL DISSOLVED SOLIDS	1600 00	10 00	MG/L	
GW PPMON	3886	GW00552WC	WQPL	TOTAL DISSOLVED SOLIDS	1900 00	14 00	MG/L	
GW PPMON	4087	GW00501WC	WQPL	TOTAL DISSOLVED SOLIDS	850 00	14 00	MG/L	
EMAD	4087	GW02790IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
EMAD	4087	GW02313IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
EMAD	4087	GW01529IT	WQPL	TOTAL DISSOLVED SOLIDS	1400 00	10 00	MG/L	
GW PPMON	41091	GW00125WC	WQPL	TOTAL DISSOLVED SOLIDS	430 00	10 00	MG/L	
EMAD	41091	GW03153IT	WQPL	TOTAL DISSOLVED SOLIDS	440 00	10 00	MG/L	
GW PPMON	41091	GW01172WC	WQPL	TOTAL DISSOLVED SOLIDS	480 00	10 00	MG/L	
GW PPMON	41091	GW01286WC	WQPL	TOTAL DISSOLVED SOLIDS	520 00	10 00	MG/L	
GW PPMON	41091	GW00550WC	WQPL	TOTAL DISSOLVED SOLIDS	520 00	14 00	MG/L	
GW PPMON	41091	GW01475WC	WQPL	TOTAL DISSOLVED SOLIDS	524 00	14 00	MG/L	
EMAD	41091	GW02171IT	WQPL	TOTAL DISSOLVED SOLIDS	530 00	10 00	MG/L	
EMAD	41091	GW02609IT	WQPL	TOTAL DISSOLVED SOLIDS	550 00	10 00	MG/L	
EMAD	41091	GW03050IT	WQPL	TOTAL DISSOLVED SOLIDS	600 00	5 00	MG/L	
GW PPMON	41091	GW03616IT	WQPL	TOTAL DISSOLVED SOLIDS	632 00	10 00	MG/L	
GW PPMON	41691	GW00440WC	WQPL	TOTAL DISSOLVED SOLIDS	310 00	10 00	MG/L	
GW PPMON	41691	GW00274GA	WQPL	TOTAL DISSOLVED SOLIDS	388 00	10 00	MG/L	
GW PPMON	41691	GW01357WC	WQPL	TOTAL DISSOLVED SOLIDS	396 00	14 00	MG/L	
GW PPMON	41691	GW01549WC	WQPL	TOTAL DISSOLVED SOLIDS	400 00	14 00	MG/L	
GW PPMON	41691	GW00247GA	WQPL	TOTAL DISSOLVED SOLIDS	410 00	10 00	MG/L	
GW PPMON	41691	GW03806IT	WQPL	TOTAL DISSOLVED SOLIDS	410 00	10 00	MG/L	
EMAD	41691	GW02090IT	WQPL	TOTAL DISSOLVED SOLIDS	430 00	10 00	MG/L	
GW PPMON	41691	GW00400GA	WQPL	TOTAL DISSOLVED SOLIDS	460 00	10 00	MG/L	
GW PPMON	41691	GW00248GA	WQPL	TOTAL DISSOLVED SOLIDS	490 00	10 00	MG/L	
GW PPMON	41691	GW03396IT	WQPL	TOTAL DISSOLVED SOLIDS	528 00	10 00	MG/L	
GW PPMON	41691	GW01010WC	WQPL	TOTAL DISSOLVED SOLIDS	540 00	10 00	MG/L	
EMAD	41691	GW02953IT	WQPL	TOTAL DISSOLVED SOLIDS	560 00	5 00	MG/L	
GW PPMON	41691	GW00275GA	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
GW PPMON	41691	GW00291GA	WQPL	TOTAL DISSOLVED SOLIDS	640 00	10 00	MG/L	
EMAD	41691	GW02615IT	WQPL	TOTAL DISSOLVED SOLIDS	680 00	10 00	MG/L	
GW PPMON	41691	GW00290GA	WQPL	TOTAL DISSOLVED SOLIDS	830 00	10 00	MG/L	
GW PPMON	4287	GW00122WC	WQPL	TOTAL DISSOLVED SOLIDS	280 00	10 00	MG/L	
EMAD	4287	GW02672IT	WQPL	TOTAL DISSOLVED SOLIDS	310 00	10 00	MG/L	
EMAD	4287	GW02246IT	WQPL	TOTAL DISSOLVED SOLIDS	330 00	10 00	MG/L	
EMAD	4287	GW01231IT	WQPL	TOTAL DISSOLVED SOLIDS	350 00	10 00	MG/L	
GW PPMON	4287	GW00548WC	WQPL	TOTAL DISSOLVED SOLIDS	360 00	14 00	MG/L	
GW PPMON	4287	GW00031GA	WQPL	TOTAL DISSOLVED SOLIDS	374 00	14 00	MG/L	
EMAD	7087	GW02776IT	WQPL	TOTAL DISSOLVED SOLIDS	450 00	10 00	MG/L	
GW PPMON	7087	GW00037GA	WQPL	TOTAL DISSOLVED SOLIDS	470 00	10 00	MG/L	
EMAD	7087	GW01540IT	WQPL	TOTAL DISSOLVED SOLIDS	500 00	10 00	MG/L	
EMAD	7087	GW02303IT	WQPL	TOTAL DISSOLVED SOLIDS	500 00	10 00	MG/L	
EMAD	7087	GW01957IT	WQPL	TOTAL DISSOLVED SOLIDS	510 00	10 00	MG/L	
GW PPMON	7087	GW00523WC	WQPL	TOTAL DISSOLVED SOLIDS	520 00	14 00	MG/L	
EMAD	7087	GW03094IT	WQPL	TOTAL DISSOLVED SOLIDS	520 00	10 00	MG/L	
GW PPMON	7087	GW01117WC	WQPL	TOTAL DISSOLVED SOLIDS	527 00	14 00	MG/L	
GW PPMON	7087	GW03608IT	WQPL	TOTAL DISSOLVED SOLIDS	550 00	14 00	MG/L	
EMAD	7187	GW02279IT	WQPL	TOTAL DISSOLVED SOLIDS	235 00	10 00	MG/L	

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GW PPMON	7187	GW00091WC	WQPL	TOTAL DISSOLVED SOLIDS	255 00	10 00	MG/L	
123456	7187	GW00903IT	WQPL	TOTAL DISSOLVED SOLIDS	260 00	10 00	MG/L	
GW PPMON	7187	GW00502WC	WQPL	TOTAL DISSOLVED SOLIDS	260 00	10 00	MG/L	
123456	7187	GW01183IT	WQPL	TOTAL DISSOLVED SOLIDS	270 00	10 00	MG/L	
EMAD	7187	GW02681IT	WQPL	TOTAL DISSOLVED SOLIDS	275 00	10 00	MG/L	
GW PPMON	7187	GW01434WC	WQPL	TOTAL DISSOLVED SOLIDS	275 00	10 00	MG/L	
GW PPMON	7187	GW01094WC	WQPL	TOTAL DISSOLVED SOLIDS	281 50	14 00	MG/L	
EMAD	7187	GW03148IT	WQPL	TOTAL DISSOLVED SOLIDS	290 00	10 00	MG/L	
EMAD	7187	GW01886IT	WQPL	TOTAL DISSOLVED SOLIDS	300 00	10 00	MG/L	
EMAD	7187	GW01541IT	WQPL	TOTAL DISSOLVED SOLIDS	300 00	10 00	MG/L	
GW PPMON	7187	GW03580IT	WQPL	TOTAL DISSOLVED SOLIDS	302 00	10 00	MG/L	
EMAD	7287	GW03089IT	WQPL	TOTAL DISSOLVED SOLIDS	220.00	10 00	MG/L	
123456	7287	GW00944IT	WQPL	TOTAL DISSOLVED SOLIDS	300 00	10 00	MG/L	
123456	7287	GW01212IT	WQPL	TOTAL DISSOLVED SOLIDS	300 00	10 00	MG/L	
GW PPMON	7287	GW01113WC	WQPL	TOTAL DISSOLVED SOLIDS	307 00	14 00	MG/L	
EMAD	7287	GW02309IT	WQPL	TOTAL DISSOLVED SOLIDS	340 00	10 00	MG/L	
GW PPMON	7287	GW00519WC	WQPL	TOTAL DISSOLVED SOLIDS	340 00	10 00	MG/L	
GW PPMON	7287	GW00113WC	WQPL	TOTAL DISSOLVED SOLIDS	350 00	14 00	MG/L	
EMAD	7287	GW01524IT	WQPL	TOTAL DISSOLVED SOLIDS	360 00	10 00	MG/L	
GW PPMON	7287	GW03604IT	WQPL	TOTAL DISSOLVED SOLIDS	380 00	10 00	MG/L	
GW PPMON	7287	GW01391WC	WQPL	TOTAL DISSOLVED SOLIDS	380 00	10 00	MG/L	
EMAD	7287	GW02783IT	WQPL	TOTAL DISSOLVED SOLIDS	400 00	10 00	MG/L	
123456	B206489	GW00956IT	WQPL	TOTAL DISSOLVED SOLIDS	308 00	10 00	MG/L	
EMAD	B206489	GW02310IT	WQPL	TOTAL DISSOLVED SOLIDS	320 00	10 00	MG/L	
GW PPMON	B206489	GW00522WC	WQPL	TOTAL DISSOLVED SOLIDS	330 00	10 00	MG/L	
GW PPMON	B206489	GW00116WC	WQPL	TOTAL DISSOLVED SOLIDS	340 00	14 00	MG/L	
EMAD	B206489	GW01959IT	WQPL	TOTAL DISSOLVED SOLIDS	360 00	10 00	MG/L	
EMAD	B206489	GW01525IT	WQPL	TOTAL DISSOLVED SOLIDS	370 00	10 00	MG/L	
EMAD	B206489	GW03246IT	WQPL	TOTAL DISSOLVED SOLIDS	420 00	10 00	MG/L	
EMAD	B206489	GW02720IT	WQPL	TOTAL DISSOLVED SOLIDS	430 00	10 00	MG/L	
123456	B206589	GW00943IT	WQPL	TOTAL DISSOLVED SOLIDS	504 00	10 00	MG/L	
EMAD	B206589	GW01961IT	WQPL	TOTAL DISSOLVED SOLIDS	520 00	10 00	MG/L	
EMAD	B206589	GW02311IT	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
GW PPMON	B206589	GW01406WC	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
GW PPMON	B206589	GW00038GA	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
EMAD	B206589	GW03091IT	WQPL	TOTAL DISSOLVED SOLIDS	560 00	10 00	MG/L	
GW PPMON	B206589	GW03609IT	WQPL	TOTAL DISSOLVED SOLIDS	570 00	14 00	MG/L	
EMAD	B206589	GW02721IT	WQPL	TOTAL DISSOLVED SOLIDS	580 00	10 00	MG/L	
GW PPMON	B206589	GW00118WC	WQPL	TOTAL DISSOLVED SOLIDS	580 00	14 00	MG/L	
GW PPMON	B206589	GW01118WC	WQPL	TOTAL DISSOLVED SOLIDS	590 00	10 00	MG/L	
GW PPMON	B206589	GW00524WC	WQPL	TOTAL DISSOLVED SOLIDS	600 00	10 00	MG/L	
EMAD	B206589	GW01526IT	WQPL	TOTAL DISSOLVED SOLIDS	1500 00	10 00	MG/L	
EMAD	B206689	GW02722IT	WQPL	TOTAL DISSOLVED SOLIDS	480 00	10 00	MG/L	
EMAD	B206689	GW03092IT	WQPL	TOTAL DISSOLVED SOLIDS	500 00	10 00	MG/L	
EMAD	B206689	GW01962IT	WQPL	TOTAL DISSOLVED SOLIDS	510 00	10 00	MG/L	
GW PPMON	B206689	GW01119WC	WQPL	TOTAL DISSOLVED SOLIDS	511 00	14 00	MG/L	
EMAD	B206689	GW01527IT	WQPL	TOTAL DISSOLVED SOLIDS	520 00	10 00	MG/L	
GW PPMON	B206689	GW00525WC	WQPL	TOTAL DISSOLVED SOLIDS	550 00	14 00	MG/L	
GW PPMON	B206689	GW03610IT	WQPL	TOTAL DISSOLVED SOLIDS	570 00	14 00	MG/L	

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EMAD	B206689	GW02312IT	WQPL	TOTAL DISSOLVED SOLIDS	580 00	10 00	MG/L	
GW PPMON	B206689	GW00040GA	WQPL	TOTAL DISSOLVED SOLIDS	590 00	10 00	MG/L	
123456	B206689	GW00953IT	WQPL	TOTAL DISSOLVED SOLIDS	592 00	10 00	MG/L	
GW PPMON	B206689	GW01407WC	WQPL	TOTAL DISSOLVED SOLIDS	600 00	14 00	MG/L	
GW PPMON	B206689	GW00119WC	WQPL	TOTAL DISSOLVED SOLIDS	700 00	10 00	MG/L	
123456	B206889	GW00951IT	WQPL	TOTAL DISSOLVED SOLIDS	3560 00	10 00	MG/L	
GW PPMON	B206889	GW00527WC	WQPL	TOTAL DISSOLVED SOLIDS	3700 00	10 00	MG/L	
EMAD	B208089	GW02635IT	WQPL	TOTAL DISSOLVED SOLIDS	510 00	10 00	MG/L	
EMAD	B208089	GW01820IT	WQPL	TOTAL DISSOLVED SOLIDS	550 00	10 00	MG/L	
EMAD	B208089	GW03133IT	WQPL	TOTAL DISSOLVED SOLIDS	550 00	10 00	MG/L	
GW PPMON	B208089	GW00558WC	WQPL	TOTAL DISSOLVED SOLIDS	600 00	10 00	MG/L	
EMAD	B208089	GW02197IT	WQPL	TOTAL DISSOLVED SOLIDS	610 00	10 00	MG/L	
GW PPMON	B208089	GW03632IT	WQPL	TOTAL DISSOLVED SOLIDS	620 00	14 00	MG/L	
GW PPMON	B208089	GW01128WC	WQPL	TOTAL DISSOLVED SOLIDS	680 00	10 00	MG/L	
EMAD	B208089	GW01472IT	WQPL	TOTAL DISSOLVED SOLIDS	700 00	10 00	MG/L	
EMAD	B208589	GW02654IT	WQPL	TOTAL DISSOLVED SOLIDS	2800 00	10 00	MG/L	
EMAD	B208589	GW02227IT	WQPL	TOTAL DISSOLVED SOLIDS	4800 00	10 00	MG/L	
EMAD	B208789	GW02208IT	WQPL	TOTAL DISSOLVED SOLIDS	780 00	10 00	MG/L	
EMAD	B208789	GW02638IT	WQPL	TOTAL DISSOLVED SOLIDS	930 00	10 00	MG/L	
GW PPMON	B208789	GW03623IT	WQPL	TOTAL DISSOLVED SOLIDS	930 00	14 00	MG/L	
EMAD	B208789	GW03132IT	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	10 00	MG/L	
EMAD	B210489	GW02655IT	WQPL	TOTAL DISSOLVED SOLIDS	2600 00	10 00	MG/L	
GW PPMON	B210489	GW00637WC	WQPL	TOTAL DISSOLVED SOLIDS	4000 00	14 00	MG/L	
GW PPMON	B210489	GW00045GA	WQPL	TOTAL DISSOLVED SOLIDS	4400 00	10 00	MG/L	
GW PPMON	B210489	GW01131WC	WQPL	TOTAL DISSOLVED SOLIDS	4516 00	14 00	MG/L	
GW PPMON	B210489	GW00144WC	WQPL	TOTAL DISSOLVED SOLIDS	4600 00	14 00	MG/L	
EMAD	B210489	GW02228IT	WQPL	TOTAL DISSOLVED SOLIDS	4600 00	10 00	MG/L	
GW PPMON	B210489	GW01420WC	WQPL	TOTAL DISSOLVED SOLIDS	4700 00	10 00	MG/L	
EMAD	B210489	GW03185IT	WQPL	TOTAL DISSOLVED SOLIDS	4800 00	10 00	MG/L	
EMAD	B210489	GW01883IT	WQPL	TOTAL DISSOLVED SOLIDS	4900 00	10 00	MG/L	
GW PPMON	B210489	GW03639IT	WQPL	TOTAL DISSOLVED SOLIDS	5720 00	10 00	MG/L	
EMAD	B210489	GW01516IT	WQPL	TOTAL DISSOLVED SOLIDS	7600 00	10 00	MG/L	
EMAD	P209789	GW03186IT	WQPL	TOTAL DISSOLVED SOLIDS	590 00	10 00	MG/L	
EMAD	P209789	GW02789IT	WQPL	TOTAL DISSOLVED SOLIDS	600 00	10 00	MG/L	
EMAD	P209789	GW02239IT	WQPL	TOTAL DISSOLVED SOLIDS	610 00	10 00	MG/L	
EMAD	P209789	GW01610IT	WQPL	TOTAL DISSOLVED SOLIDS	660 00	10 00	MG/L	
GW PPMON	P209789	GW01048WC	WQPL	TOTAL DISSOLVED SOLIDS	670 00	10 00	MG/L	
123456	P209789	GW01025IT	WQPL	TOTAL DISSOLVED SOLIDS	690 00	10 00	MG/L	
EMAD	P209789	GW01837IT	WQPL	TOTAL DISSOLVED SOLIDS	740 00	10 00	MG/L	
GW PPMON	P209789	GW00021WC	WQPL	TOTAL DISSOLVED SOLIDS	950 00	14 00	MG/L	
GW PPMON	P209789	GW00493WC	WQPL	TOTAL DISSOLVED SOLIDS	1000 00	14 00	MG/L	
GW PPMON	P209789	GW03551IT	WQPL	TOTAL DISSOLVED SOLIDS	1030 00	10 00	MG/L	
GW PPMON	P209789	GW01379WC	WQPL	TOTAL DISSOLVED SOLIDS	1100 00	10 00	MG/L	
GW PPMON	P218389	GW01522WC	WQPL	TOTAL DISSOLVED SOLIDS	405 00	14 00	MG/L	
GW PPMON	P219489	GW01523WC	WQPL	TOTAL DISSOLVED SOLIDS	509 00	14 00	MG/L	

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QUAL_W	CHEM_COMME	QAQCTYP	DATE_LOAD	DATE_ANALY	DATE_SA	N16
	V,,,,,05 OCT 93, 261183	TRG	11/2/93 08 59 2		4/21/93	
	V , 25 AUG 93 242935	TRG	11/2/93 08 59 2		3/22/93	
	V ,, ,05 OCT 93 261184	TRG	11/2/93 08 59 2		4/21/93	
	V , 25 AUG 93, 242936	TRG	11/2/93 08 59 2		3/22/93	
V	18 SEP 92 ,,TRG,,,1494306	REAL	3/31/94 20 42 0	5/19/92 00 00 00	5/14/92	
V	10 MAR 94 ,,TR1,,,3468301	REAL	3/31/94 20 42 0	9/6/93 00 00 00	8/30/93	
V	14 MAR 94 TRG 3496497	REAL	3/31/94 20 42 0	12/6/93 00 00 00	11/30/93	
V	08 JUL 92,,,,TRG,,,168816	REAL	3/31/94 20 42 0	3/3/92 00 00 00	2/27/92	
JA	05 OCT 93,1,,,,TRG,,,2615638	REAL	3/31/94 20 42 0	5/12/93 00 00 00	5/4/93	
V	11 AUG 93,,,,TRG,,,2335933	REAL	3/31/94 20 42 0	3/1/93 00 00 00	2/22/93	
V	01 APR 92,, ,TRG,,,1131265	REAL	3/31/94 20 42 0	12/23/91 00 00 0	12/19/91	
V	04 MAR 93,,,,TRG,,,1897527	REAL	3/31/94 20 42 0	11/12/92 00 00 0	11/9/92	
V	16 MAR 94 ,,,TRG ,1720720	REAL	3/31/94 20 42 0	8/6/92 00 00 00	8/3/92	
V	16 MAR 94, ,,,TRG,, 1873336	REAL	3/31/94 20 42 0	9/22/92 00 00 00	9/15/92	
V	01 FEB 92 ,, ,TRG, 1073606	REAL	3/31/94 20 42 0	6/24/91 00 00 00	6/20/91	
V	01 FEB 92 , TRG 1101801	REAL	3/31/94 20 42 0	9/17/91 00 00 00	9/12/91	
V	17 JUL 92, ,TRG,, 1317674	REAL	3/31/94 20 42 0	4/7/92 00 00 00	4/1/92	
V	07 APR 93 ,,,TRG ,2043076	REAL	3/31/94 20 42 0	11/21/92 00 00 0	11/18/92	
V	01 APR 92,,,,TRG,,,120088	REAL	3/31/94 20 42 0	11/20/91 00 00 0	11/14/91	
	,,, TRG ,1520296	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92	
V	24 AUG 92,,,,TRG,,,1450658	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/23/92	
V	11 SEP 93,,,,TRG, ,2521596	REAL	3/31/94 20 42 0	4/20/93 00 00 00	4/15/93	
V	29 MAY 92,,,,TRG,,,1356394	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/18/91	
V	17 JUL 92 TRG,, 1378890	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	20 NOV 92, ,,TRG,,,1579663	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/16/92	
	,, TRG 1073856	REAL	3/31/94 20 42 0	3/25/91 00 00 00	3/18/91	
V	17 JUL 92 ,TRG,, 1378887	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/14/92	
V	01 FEB 92 ,,,TRG ,1073899	REAL	3/31/94 20 42 0	5/7/91 00 00 00	5/2/91	
V	16 MAR 94 TRG, 7118	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/21/92	
V	04 MAR 93 ,,TRG,,,1944373	REAL	3/31/94 20 42 0	10/12/92 00 00 0	10/7/92	
V	29 MAY 92,,,,TRG,,,1356395	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/19/91	
V	01 FEB 92,,,,TRG,,,1123159	REAL	3/31/94 20 42 0	10/22/91 00 00 0	10/15/91	
V	20 NOV 92 ,,,TRG,, 1579658	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/14/92	
V	17 JUL 92,, TRG ,1378892	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	20 NOV 92,, ,TRG,,,1579652	REAL	3/31/94 20 42 0	7/16/92 00 00 00	7/13/92	
V	16 MAR 94 ,,,TRG 7119	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/20/92	
V	04 MAR 93, ,,,TRG,,,1944290	REAL	3/31/94 20 42 0	10/19/92 00 00 0	10/13/92	
V	17 JUL 92,,, TRG 1378889	REAL	3/31/94 20 42 0	4/20/92 00 00 00	4/15/92	
V	01 FEB 92, ,,TRG,,,1074075	REAL	3/31/94 20 42 0	4/29/91 00 00 00	4/24/91	
	,, TRG, 1074072	REAL	3/31/94 20 42 0	3/21/91 00 00 00	3/15/91	
Y	, TRG ,3619678	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94	
V	16 MAR 94,,,,TRG,,,5142	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92	
V	01 FEB 92,,,,TRG,,,1124519	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/22/91	
V	11 SEP 93, TRG ,2521636	REAL	3/31/94 20 42 0	4/20/93 00 00 00	4/13/93	
V	10 MAR 94, ,,,TR1 ,3470159	REAL	3/31/94 20 42 0	10/31/93 00 00 0	10/28/93	
V	20 NOV 92,,,,TRG,, 1716667	REAL	3/31/94 20 42 0	8/4/92 00 00 00	7/30/92	
V	19 OCT 93 TRG 2795403	REAL	3/31/94 20 42 0	8/6/93 00 00 00	8/4/93	
	TRG , 1074109	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91	

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V	30 JUL 93 TRG 2267169	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	16 MAR 94,,,,TRG,,,7104	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/15/92
V	01 FEB 92,, ,TRG,,,1072640	REAL	3/31/94 20 42 0	4/22/91 00 00 00	4/18/91
V	06 JUL 93,,,,TRG,,,2216355	REAL	3/31/94 20 42 0	2/11/93 00 00 00	2/5/93
JA	10 MAR 94,1,,,TR1,,,3457415	REAL	3/31/94 20 42 0	8/10/93 00 00 00	8/2/93
	,,,TRG,,,1072675	REAL	3/31/94 20 42 0	3/12/91 00 00 00	3/4/91
V	22 FEB 94,,, TRG,,,3384664	REAL	3/31/94 20 42 0	10/25/93 00 00 0	10/20/93
V	11 SEP 93,, ,TRG,,,2521626	REAL	3/31/94 20 42 0	4/20/93 00 00 00	4/13/93
V	16 MAR 94,, TRG,,,1921847	REAL	3/31/94 20 42 0	10/12/92 00 00 0	10/7/92
V	01 FEB 92 ,,,TRG 1124511	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/21/91
V	17 JUL 92,, ,TRG,,,1378882	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/13/92
V	20 NOV 92 TRG 1579668	REAL	3/31/94 20 42 0	7/23/92 00 00 00	7/16/92
	, TRG , 1072711	REAL	3/31/94 20 42 0	7/15/91 00 00 00	7/11/91
V	17 JUL 92, ,,,TRG,,,1376867	REAL	3/31/94 20 42 0	4/13/92 00-00 00	4/7/92
V	03 MAR 94,,,,TRG ,3423729	REAL	3/31/94 20 42 0	11/1/93 00 00 00	10/29/93
V	01 FEB 92,,,,TRG,,,1122331	REAL	3/31/94 20 42 0	10/17/91 00 00 0	10/10/91
JA	10 MAR 94,1,,,TR1,,,3457417	REAL	3/31/94 20 42 0	8/10/93 00 00 00	8/2/93
V	16 MAR 94,,,,TRG,,,1921904	REAL	3/31/94 20 42 0	10/12/92 00 00 0	10/7/92
V	30 JUL 93,,,, TRG,,,2267125	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/1/93
V	01 FEB 92,,,,TRG,,,1073773	REAL	3/31/94 20 42 0	3/11/91 00 00 00	3/4/91
	,,,TRG ,2486679	REAL	3/31/94 20 42.0	4/19/93 00 00 00	4/16/93
V	20 NOV 92,,,,TRG,,,1711822	REAL	3/31/94 20 42 0	7/30/92 00 00 00	7/27/92
	,,, TRG,, 1073887	REAL	3/31/94 20 42 0	7/12/91 00-00 00	7/9/91
V	01 FEB 92, ,,,TRG ,1073886	REAL	3/31/94 20 42 0	4/22/91 00.00 00	4/18/91
V	25 AUG 93,,,,TRG,,,2313527	REAL	3/31/94 20 42 0	3/8/93 00 00 00	3/5/93
Y	,,,TRG ,3529705	REAL	3/31/94 20 42 0	12/16/93 00 00 0	12/13/93
V	13 OCT 93,,,,TRG,,,2670200	REAL	3/31/94 20 42 0	5/12/93 00 00 00	5/6/93
V	01 FEB 92,,,,TRG,,,1074162	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/29/91
V	16 MAR 94,,,,TRG,,,5129	REAL	3/31/94 20 42 0	1/14/92 00 00 00	1/10/92
V	28 FEB 94 ,,,TRG 3415337	REAL	3/31/94 20 42 0	9/27/93 00 00 00	9/22/93
	,,,TRG ,1074176	REAL	3/31/94 20 42 0	7/12/91 00 00 00	7/9/91
V	07 APR 93 ,,,TRG, 2003335	REAL	3/31/94 20 42 0	12/15/92 00 00 0	12/10/92
	,,, TRG,,,1074175	REAL	3/31/94 20 42 0	3/21/91 00 00 00	3/14/91
V	01 FEB 92 TRG,,,1122039	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/8/91
V	17 JUL 92 ,, TRG ,1376864	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/7/92
V	16 MAR 94,,,,TRG,,,1872561	REAL	3/31/94 20 42 0	8/10/92 00 00 00	8/5/92
V	17 JUL 92 ,,,TRG,,,1376868	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/8/92
V	01 FEB 92,,,,TRG,,,1072797	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/30/91
V	01 FEB 92 , ,TRG,, 1073016	REAL	3/31/94 20 42 0	5/2/91 00 00 00	4/30/91
V	01 FEB 92,,,,TRG ,1123158	REAL	3/31/94 20 42 0	10/22/91 00 00 0	10/15/91
V	29 MAY 92 , TRG 1356391	REAL	3/31/94 20 42 0	7/19/91 00 00 00	7/17/91
	,,,TRG ,1073135	REAL	3/31/94 20 42 0	3/25/91 00 00 00	3/19/91
Y	TRG 3640046	REAL	3/31/94 20 42 0	2/1/94 00 00 00	1/27/94
V	17 JUL 92 ,,,TRG,,,1378883	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/14/92
Y	TRG ,3529701	REAL	3/31/94 20 42 0	12/16/93 00 00 0	12/13/93
V	28 FEB 94 ,,,TRG,, 3419761	REAL	3/31/94 20 42 0	9/29/93 00 00 00	9/23/93
V	17 FEB 93,,,,TRG ,1856589	REAL	3/31/94 20 42 0	9/21/92 00 00 00	9/18/92
V	04 MAR 93 , TRG 1944238	REAL	3/31/94 20 42 0	10/19/92 00 00 0	10/13/92
V	01 FEB 92,,,,TRG,,,1072798	REAL	3/31/94 20 42 0	5/9/91 00 00 00	5/6/91

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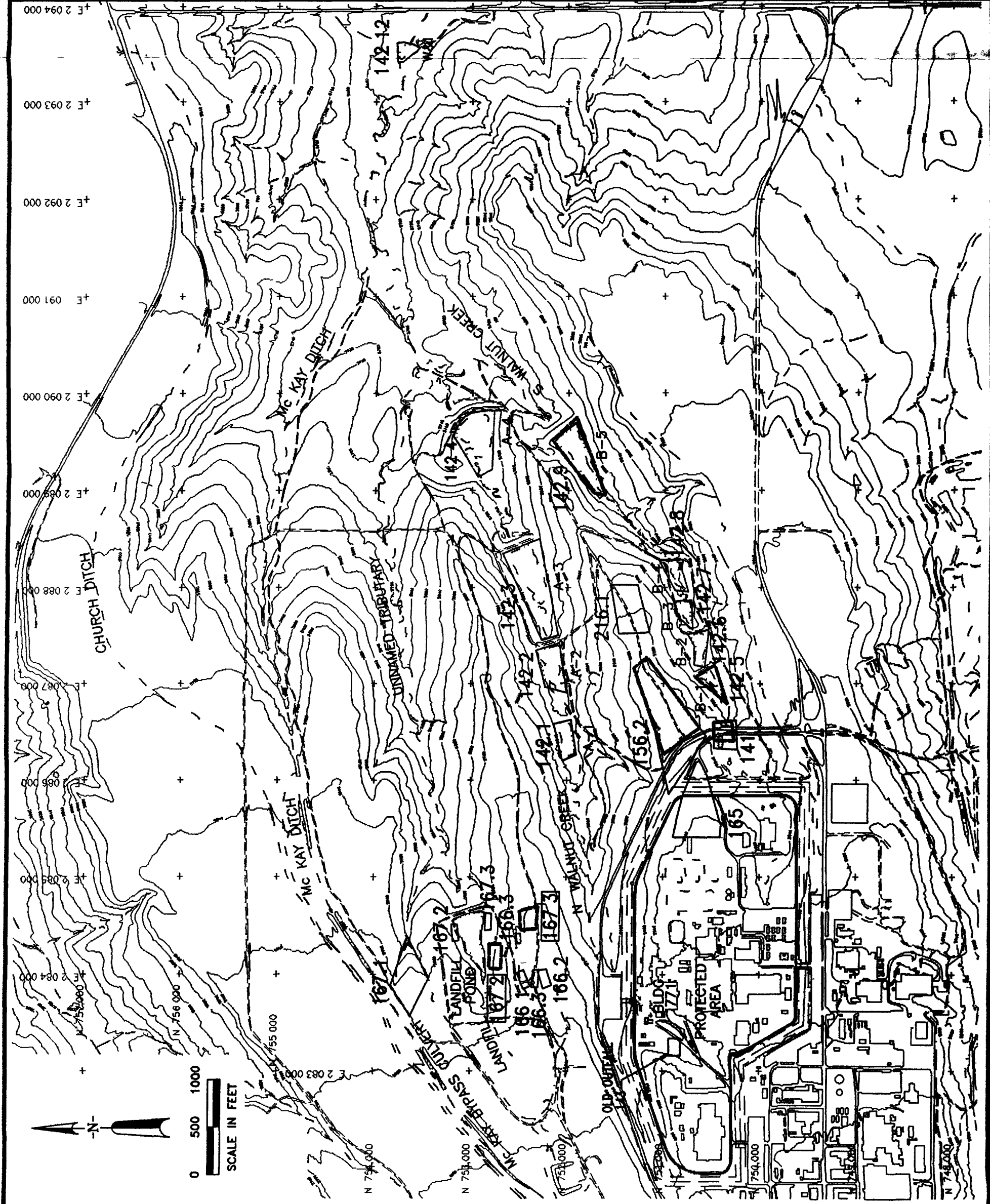
V	25 AUG 93 ,,,TRG, 2336073	REAL	3/31/94 20 42 0	3/8/93 00 00 00	3/2/93
V	17 JUL 92 ,,,TRG 1378880	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/13/92
V	11 SEP 93 ,,,TRG ,2521606	REAL	3/31/94 20 42 0	4/20/93 00 00 00	4/14/93
V	05 OCT 93,,,,,TRG,,,2611786	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/20/93
V	24 AUG 92 , ,TRG,, 1452153	REAL	3/31/94 20 42 0	5/4/92 00 00 00	4/28/92
V	16 MAR 94,,,TRG,,,164746	REAL	3/31/94 20 42 0	2/27/92 00 00 00	2/21/92
	,,,,TRG,,,1072801	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/17/91
V	06 JUL 93 ,,,TRG,,,2222112	REAL	3/31/94 20 42 0	2/23/93 00 00 00	2/18/93
V	20 NOV 92,,,,,TRG,,,1587771	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/22/92
V	19 OCT 93,,,,,TRG,,,2814550	REAL	3/31/94 20 42 0	8/17/93 00 00 00	8/13/93
V	06 JAN 94,,, TRG,,,2862037	REAL	3/31/94 20 42 0	9/21/93 00 00 00	9/16/93
V	05 OCT 93,,,,,TRG ,2615847	REAL	3/31/94 20 42 0	5/18/93 00 00 00	5/11/93
Y	, TR1 3527505	REAL	3/31/94 20 42 0	11/15/93 00 00 0	11/8/93
V	01 APR 92 , ,TRG, ,1131269	REAL	3/31/94 20 42 0	12/27/91 00 00 0	12/20/91
V	08 JUL 92 ,,,TRG,,,1272220	REAL	3/31/94 20 42 0	3/23/92 00 00 00	3/17/92
	,,,,TRG,,,1520294	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92
V	16 MAR 94 ,,,TRG,,,1919245	REAL	3/31/94 20 42 0	10/14/92 00 00 0	10/9/92
V	25 AUG 93,,,,,TRG,,,2294770	REAL	3/31/94 20 42 0	3/22/93 00 00 00	3/17/93
Y	,,,TRG,,,3687246	REAL	3/31/94 20 42 0	2/23/94 00 00 00	2/18/94
V	10 MAR 94,,,,,TR1,,,3467796	REAL	3/31/94 20 42 0	9/25/93 00 00 00	9/20/93
Y	,, TR1,, 3578841	REAL	3/31/94 20 42 0	12/14/93 00 00 0	12/9/93
Y	, ,TRG,, 3643606	REAL	3/31/94 20 42 0	2/21/94 00 00 00	2/16/94
V	07 APR 93 TRG ,1997947	REAL	3/31/94 20 42 0	11/24/92 00.00 0	11/18/92
V	27 APR 92,, TRG, ,1127492	REAL	3/31/94 20 42 0	12/12/91 00 00 0	12/7/91
Y	,,,TRG ,3687543	REAL	3/31/94 20 42 0	3/9/94 00 00 00	3/3/94
Y	,,,TRG 3643607	REAL	3/31/94 20 42 0	2/21/94 00 00 00	2/16/94
V	17 FEB 93,,,,,TRG,,,1856029	REAL	3/31/94 20 42 0	9/21/92 00 00 00	9/16/92
V	15 SEP 93 ,,,TRG ,2719680	REAL	3/31/94 20 42 0	6/25/93 00 00 00	6/22/93
	,,,,TRG,,,1520295	REAL	3/31/94 20 42 0	6/23/92 00 00 00	6/11/92
Y	,,,,TRG ,3643608	REAL	3/31/94 20 42 0	2/23/94 00 00 00	2/18/94
Y	,, ,TRG,,,3675116	REAL	3/31/94 20 42 0	3/2/94 00 00 00	2/24/94
V	17 JUL 92,,,,,TRG ,1317675	REAL	3/31/94 20 42 0	4/7/92 00 00 00	4/1/92
Y	,,,,TRG,,,3668466	REAL	3/31/94 20 42 0	2/25/94 00 00 00	2/21/94
V	06 JUL 93 ,,,TRG,,,2222111	REAL	3/31/94 20 42 0	2/23/93 00 00 00	2/17/93
V	24 AUG 92 ,,,TRG,,,1450651	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/21/92
V	16 MAR 94,, ,TRG,,,7112	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/16/92
V	01 FEB 92 , ,TRG 1073562	REAL	3/31/94 20 42 0	5/7/91 00 00 00	5/3/91
V	05 OCT 93,,,,,TRG,,,2615838	REAL	3/31/94 20 42 0	5/18/93 00 00 00	5/11/93
Y	,TR1, 3674410	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/18/94
V	17 SEP 92,,,,,TRG,,,1453491	REAL	3/31/94 20 42 0	5/4/92 00 00 00	4/28/92
Y	,,,,TRG,,,3619675	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
V	29 MAY 92, ,TRG,,,1356401	REAL	3/31/94 20 42 0	7/24/91 00 00 00	7/19/91
V	16 MAR 94,, ,TRG ,160777	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/21/92
V	01 FEB 92,,,,,TRG,,,1125620	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	11 SEP 93 , ,TRG,, 2521542	REAL	3/31/94 20 42 0	4/20/93 00 00 00	4/12/93
V	20 NOV 92 ,,,TRG,, 1586367	REAL	3/31/94 20 42 0	7/29/92 00 00 00	7/23/92
V	10 MAR 94,, ,TR1 3458160	REAL	3/31/94 20 42 0	8/14/93 00 00 00	8/10/93
V	04 MAR 93 , TRG 1944521	REAL	3/31/94 20 42 0	10/10/92 00 00 0	10/6/92
V	16 MAR 94 TRG ,7107	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/16/92 *

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V	06 JUL 93,,,,TRG,,,2260556	REAL	3/31/94 20 42 0	2/25/93 00 00 00	2/19/93 *
	,,,TRG,,,1073276	REAL	3/31/94 20 42 0	3/12/91 00 00 00	3/4/91
V	03 MAR 94,,,,TRG,,,2461839	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/9/93 *
V	01 FEB 92, TRG,, 1073310	REAL	3/31/94 20 42 0	4/25/91 00 00 00	4/22/91
V	24 AUG 92 ,,,TRG,,,1450645	REAL	3/31/94 20 42 0	4/22/92 00 00 00	4/20/92 *
V	01 MAR 94,, TRG 3427280	REAL	3/31/94 20 42 0	11/9/93 00 00 00	11/3/93 *
V	10 MAR 94,,,,TR1,,,3458150	REAL	3/31/94 20 42 0	8/14/93 00 00 00	8/11/93 *
V	20 NOV 92,, TRG ,1586365	REAL	3/31/94 20 42 0	7/29/92 00 00 00	7/22/92
V	01 FEB 92 TRG 1122322	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/9/91
V	29 MAY 92,,,,TRG,,,1356393	REAL	3/31/94 20 42 0	7/19/91 00 00 00	7/17/91
V	16 MAR 94,,, TRG, ,1919697	REAL	3/31/94 20 42 0	10/14/92 00 00 0	10/9/92 *
V	25 SEP 92,,,,TRG,, 1552764	REAL	3/31/94 20 42 0	7/13/92 00 00 00	7/7/92
	TRG , 1073427	REAL	3/31/94 20 42 0	3/21/91 00 00-00	3/11/91
V	01 FEB 92,,,,TRG,,,1073428	REAL	3/31/94 20 42 0	4/25/91 00 00 00	4/23/91
V	10 MAR 94 TR1 ,3458158	REAL	3/31/94 20 42 0	8/14/93 00 00 00	8/9/93
V	16 MAR 94 ,,,TRG ,160768	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/20/92
V	03 MAR 94,, ,TRG, 2461838	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/8/93
V	30 JUL 93 , TRG, 2267136	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/1/93
	,,,TRG,,,1073585	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/15/91
V	16 MAR 94,, TRG,,,1921812	REAL	3/31/94 20 42 0	10/12/92 00 00 0	10/7/92
V	22 FEB 94,,,,TRG,,,3384662	REAL	3/31/94 20 42 0	10/20/93 00 00 0	10/13/93
V	24 AUG 92,,,,TRG ,1450665	REAL	3/31/94 20 42 0	4/30/92 00 00 00	4/23/92
V	29 MAY 92,,,,TRG,,,1734726	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
V	16 MAR 94,,,,TRG,,,160769	REAL	3/31/94 20 42 0	2/25/92 00 00 00	2/20/92
V	03 MAR 94,,,,TRG,,,2461848	REAL	3/31/94 20 42 0	4/13/93 00 00 00	4/8/93
V	30 JUL 93,,,TRG, 2267179	REAL	3/31/94 20 42-0	2/6/93 00 00 00	2/2/93
V	01 FEB 92,,,,TRG,, 1125621	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
	,,,TRG,,,1073607	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	20 NOV 92, TRG 1711830	REAL	3/31/94 20 42 0	8/4/92 00 00 00	7/30/92
V	17 JUL 92 ,,,TRG,, 1381465	REAL	3/31/94 20 42 0	4/22/92 00 00 00	4/16/92
V	29 MAY 92 ,TRG , 1773080	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
V	01 FEB 92 ,,,TRG,,,1125623	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	08 JUL 92,,, TRG,,,89280	REAL	3/31/94 20 42 0	2/10/92 00 00 00	2/7/92
V	01 MAR 94,,,TRG,,,3427289	REAL	3/31/94 20 42 0	11/9/93 00 00 00	11/5/93
Y	,,,TRG,,,3619681	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
V	22 NOV 92,,,,TRG,,,1555915	REAL	3/31/94 20 42 0	7/16/92 00 00 00	7/14/92
V	04 MAR 93,,,,TRG, 1944460	REAL	3/31/94 20 42 0	10/10/92 00 00 0	10/6/92
V	24 AUG 92 ,,,TRG,, 1450657	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/21/92
V	30 JUL 93,,,,TRG,,,2267194	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	19 OCT 93 , TRG 2795410	REAL	3/31/94 20 42 0	8/17/93 00 00 00	8/12/93
	,,,TRG ,2486676	REAL	3/31/94 20 42 0	4/19/93 00 00 00	4/16/93
	,TRG, 1072844	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	24 AUG 92, ,,,TRG,,,1450661	REAL	3/31/94 20 42 0	4/27/92 00 00 00	4/23/92
V	20 NOV 92,,,,TRG,,,1579662	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/16/92
V	01 FEB 92,,,,TRG,,,1125624	REAL	3/31/94 20 42 0	11/7/91 00 00 00	10/31/91
V	10 MAR 94 ,TR1 ,3458161	REAL	3/31/94 20 42 0	8/14/93 00 00 00	8/10/93
	,,,TRG,,,1073915	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/16/91
V	05 OCT 93 TRG 2611822	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/21/93
V	04 MAR 93 TRG 1944450	REAL	3/31/94 20 42 0	10/10/92 00 00 0	10/6/92

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V	16 MAR 94	TRG ,164757	REAL	3/31/94 20 42 0	2/27/92 00 00 00	2/22/92
Y		,TRG, ,3629837	REAL	3/31/94 20 42 0	2/1/94 00 00 00	1/25/94
V	29 MAY 92	, TRG 1734718	REAL	3/31/94 20 42 0	3/19/91 00 00 00	3/12/91
V	10 MAR 94	,,,TR1,,,3470003	REAL	3/31/94 20 42 0	10/23/93 00 00 0	10/18/93
V	06 JUL 93	,,,TRG,,,2222103	REAL	3/31/94 20 42 0	2/17/93 00 00 00	2/11/93
JA	01 FEB 92	1,,, TRG,,,1102569	REAL	3/31/94 20 42 0	3/25/91 00 00 00	3/12/91
V	11 SEP 93	,,,TRG,,,2484792	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/22/93
V	17 JUL 92	,,, TRG,,,1376880	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
V	01 FEB 92	,,,TRG,,,1122041	REAL	3/31/94 20 42 0	10/14/91 00 00 0	10/8/91
V	20 NOV 92,	TRG ,1587605	REAL	3/31/94 20 42 0	7/21/92 00 00 00	7/15/92
V	11 SEP 93,	,,,TRG,,,2484794	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/23/93
V	16 MAR 94	,, TRG ,5132	REAL	3/31/94 20 42 0	1/14/92 00 00 00	1/10/92
V	04 MAR 93	,,,TRG,, ,1944490	REAL	3/31/94 20 42 0	10/10/92 00 00 0	10/6/92
V	19 OCT 93	,,,TRG ,2808730	REAL	3/31/94 20 42 0	8/3/93 00 00 00	7/28/93
		,,,TRG,,,1074082	REAL	3/31/94 20 42 0	7/15/91 00 00 00	7/10/91
V	17 JUL 92	,,,TRG,,,1376882	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
V	16 MAR 94	,,, TRG,,,5145	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92
V	16 MAR 94	,,,TRG,,,5146	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/14/92
V	17 JUL 92,	,,TRG,,,1376876	REAL	3/31/94 20 42 0	4/13/92 00 00 00	4/9/92
V	04 MAR 93,	,,,TRG,,,1944492	REAL	3/31/94 20 42 0	10/10/92 00 00 0	10/6/92
V	20 NOV 92	,,,TRG,,,1581872	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/21/92
V	17 JUL 92,	TRG 1378878	REAL	3/31/94 20 42 0	4/16/92 00 00 00	4/10/92
JA	05 OCT 93,1	,,TRG ,2611945	REAL	3/31/94 20 42 0	4/27/93 00 00 00	4/19/93
Y		,,,TRG,,,3619677	REAL	3/31/94 20 42 0	1/25/94 00 00 00	1/20/94
V	10 MAR 94	,,, TR1,,,3457420	REAL	3/31/94 20 42 0	8/10/93 00 00 00	8/4/93
V	30 JUL 93	,,,TRG ,2267204	REAL	3/31/94 20 42 0	2/6/93 00 00 00	2/2/93
V	16 MAR 94	,,,TRG,,,5140	REAL	3/31/94 20 42 0	1/20/92 00 00 00	1/13/92
V	22 FEB 94	,,,TRG,,,3384665	REAL	3/31/94 20 42 0	10/25/93 00 00 0	10/20/93
V	20 NOV 92	,,,TRG,,,1581869	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/20/92
V	01 FEB 92,	TRG,, ,1124512	REAL	3/31/94 20 42 0	10/24/91 00 00 0	10/21/91
V	16 MAR 94	,,,TRG,, ,1919370	REAL	3/31/94 20 42 0	10/14/92 00 00 0	10/8/92
		,,TRG,, ,1074107	REAL	3/31/94 20 42 0	7/18/91 00 00 00	7/15/91
V	20 NOV 92	,,, TRG ,1581870	REAL	3/31/94 20 42 0	7/27/92 00 00 00	7/20/92
V	24 AUG 92	TRG ,1452146	REAL	3/31/94 20 42 0	4/29/92 00 00 00	4/24/92
V	16 MAR 94	, TRG ,7117	REAL	3/31/94 20 42 0	1/23/92 00 00 00	1/20/92
		,,, TRG,, ,1124319	REAL	3/31/94 20 42 0	8/7/91 00 00 00	8/1/91
V	06 JAN 94,	TRG,, ,2765809	REAL	3/31/94 20 42 0	7/19/93 00 00 00	7/16/93
V	01 FEB 92	,,,TRG,,,1074073	REAL	3/31/94 20 42 0	4/1/91 00 00 00	3/26/91
V	01 FEB 92	,,,TRG,,,1122335	REAL	3/31/94 20 42 0	10/17/91 00 00 0	10/11/91
V	06 JUL 93	,,,TRG,,,2267272	REAL	3/31/94 20 42 0	2/12/93 00 00 00	2/9/93
V	11 SEP 93,	,,,TRG, ,2463335	REAL	3/31/94 20 42 0	4/9/93 00 00 00	4/6/93
V	04 MAR 93	,,, TRG,,,1959295	REAL	3/31/94 20 42 0	10/22/92 00 00 0	10/16/92
V	22 FEB 94	TRG 3384657	REAL	3/31/94 20 42 0	10/20/93 00 00 0	10/15/93
V	14 MAR 94	,,,TR1 ,3520751	REAL	3/31/94 20 42 0	11/22/93 00 00 0	11/16/93
V	14 MAR 94	,,,TR1 ,3520752	REAL	3/31/94 20 42 0	11/22/93 00 00 0	11/16/93



EXPLANATION

PONDS/LAKES

OU6 IHSS S

PROTECTED AREA BOUNDARY

OU6 HISTORICAL IHSS BOUNDARY
ON IHSSs 141 142 5 142 9
143 156 2 167 2 & 167 3

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- 141 SLUDGE DISPERSAL AREA
- 142 PONDS
- 143 OLD OUTFALL
- 156 SOIL DUMP AREA
- 165 TRIANGLE AREA
- 166 TRENCHES A, B, C
- 167 SPRAY FIELDS
- 216 EAST SPRAY FIELDS

IHSS LOCATIONS SHOWN ARE BASED
ON REVISED INTERPRETATIONS IN
HRR EG&G JUNE 1993

U S DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

OPERABLE UNIT NO 6
PHASE I RFI/RI REPORT

INDIVIDUAL HAZARDOUS
SUBSTANCE SITES
WITHIN OPERABLE UNIT NO 6

TABLF 2 3
PHASE I ANALYTICAL PROGRAM

IHSS	Location	Media	Total U	Total Cr	Be	H3	Nitrate/ Nitrite as N	Gross α	Gross β	U 233/234	U 235	U 238	Pu 239/240	Am 241	Cs 137	Sr 89/90
141	Surface samples on 25 grd	Surface soil	X	X	X		X	X	X	X	X	X	X	X		
	Well downgradient of unit	Groundwater						X	X	X	X	X	X	X		
142	Sediment samples	Sediment	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Dry sediment samples	Sediment	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Water samples	Surface water	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Wells downgradient of A-4 and B 5 including the four Bedrock Wells in North Walnut Creek	Groundwater	X	X	X	X	X	X	X	X	X	X	X	X	X	X
156	Surface samples	Surface soil					X	X	X	X	X	X	X	X		
	Borings	Subsurface soil					X	X	X	X	X	X	X	X		
	Well within unit	Groundwater					X	X	X	X	X	X	X	X		
165	Surface samples from transect locations	Surface soil		X	X		X	X	X	X	X	X	X	X		
	Borings to confirm soil gas	Subsurface soil		X	X		X	X	X	X	X	X	X	X		
	Borings transecting plumes grabs from 2 intervals 6 composites	Subsurface soil		X	X		X	X	X	X	X	X	X	X		
	Wells within the site	Groundwater					X	X	X							
166	Borings along each trench grabs from 2 intervals 6 composites	Subsurface soil					X	X	X	X	X	X	X	X		
	Well downgradient of the trenches and the Bedrock Well located in unnamed tributary of North Walnut Creek	Groundwater					X	X	X							
	Surface and core samples on 100 grid	Surface and Subsurface soil					X	X	X	X	X	X	X	X		
216	Wells downgradient of units	Groundwater				X	X						X	X		
	Surface and core samples	Surface and Subsurface soil				X		X	X	X	X	X	X	X		
N/A	Stream	Sediments				X	X	X	X	X	X	X	X	X	X	X

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TABLE 2 3
(continued)

Filtered																		
IHSS	Location	Media	TAL Metals/ Additional Metals	TOC	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	WQPL	U			Pu 239/240	Cs 137	Sr 89/90	Am 241	TAL Metals	Additional Parameters for IHSS 142 1 9 & 12 Water Samples	Aquatic Toxicity
									233/ 234	U 235	U 238							
141	Surface samples on 25 grid	Surface soil	X				X											
	Well downgradient of unit	Groundwater	X		X													
142	Sediment samples	Sediment	X	X	X		X											
	Dry sediment samples	Sediment	X		X		X											
	Water samples	Surface water	X		X			X	X	X	X	X	X	X	X	X		X
	Wells downgradient of A-4 and B 5 including the four Bedrock Wells in North Walnut Creek	Groundwater	X		X			X	X	X	X	X	X	X	X	X		
156	Surface samples	Surface soil	X	X														
	Borings	Subsurface soil	X															
	Well within unit	Groundwater	X					X	X	X	X	X			X	X		
	Surface samples from transect locations	Surface soil	X	X			X											
165	Borings to confirm soil gas	Subsurface soil			X													
	Borings transecting plumes grabs from 2 intervals 6 composites	Subsurface soil	X		X													
	Wells within the site	Groundwater	X		X		X											
	Borings along each trench grabs from 2 intervals 6 composites	Subsurface soil	X		X													
	Well downgradient of the trenches and the Bedrock Well located in unnamed tributary of North Walnut Creek	Groundwater	X		X		X											
	Surface and core samples on 100 grid	Surface and Subsurface soil	X	X														
216	Wells downgradient of units	Groundwater	X		X		X		X	X	X	X						
	Surface and core samples	Surface and Subsurface soil	X	X														
N/A	Stream	Sediments	X	X	X	X	X											

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TABLE 2.3
(continued)

* Six randomly chosen surface soil samples will be analyzed for TCL pesticides/PCBs

- α = Alpha
- β = Beta
- Am = Americium
- Be = Beryllium
- Cr = Chromium
- Cs = Cesium
- H3 = Tritium
- N = Nitrogen
- Pu = Plutonium
- Sr = Strontium
- SVOCs = Semivolatile Organic Compounds
- TAL = Target Analyte List
- TCL = Target Compound List
- TDS = Total Dissolved Solids
- TOC = Total Organic Carbon
- U = Uranium
- VOCs = Volatile Organic Compounds
- UIISO = Uranium Isotopes
- GFAA = Graphite Furnace Atomic Absorption
- WQPL = Water Quality Parameters List
- NH₄⁺ = Ammonium ion as NH₄
- PCBs = Polychlorinated Biphenyls

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EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITES

0586 ○ MONITORING WELL (ALLUVIAL)

UHSU = UPPER HYDROSTRATIGRAPHIC UNIT

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SAMPLE DATE	ANALYTE	ANALYTE CONCENTRATION (ug/l) LAB QUALITY AND VALIDATION CODE	LOCATION
2/26/92	▲	▲	0686 ▲

NOTES

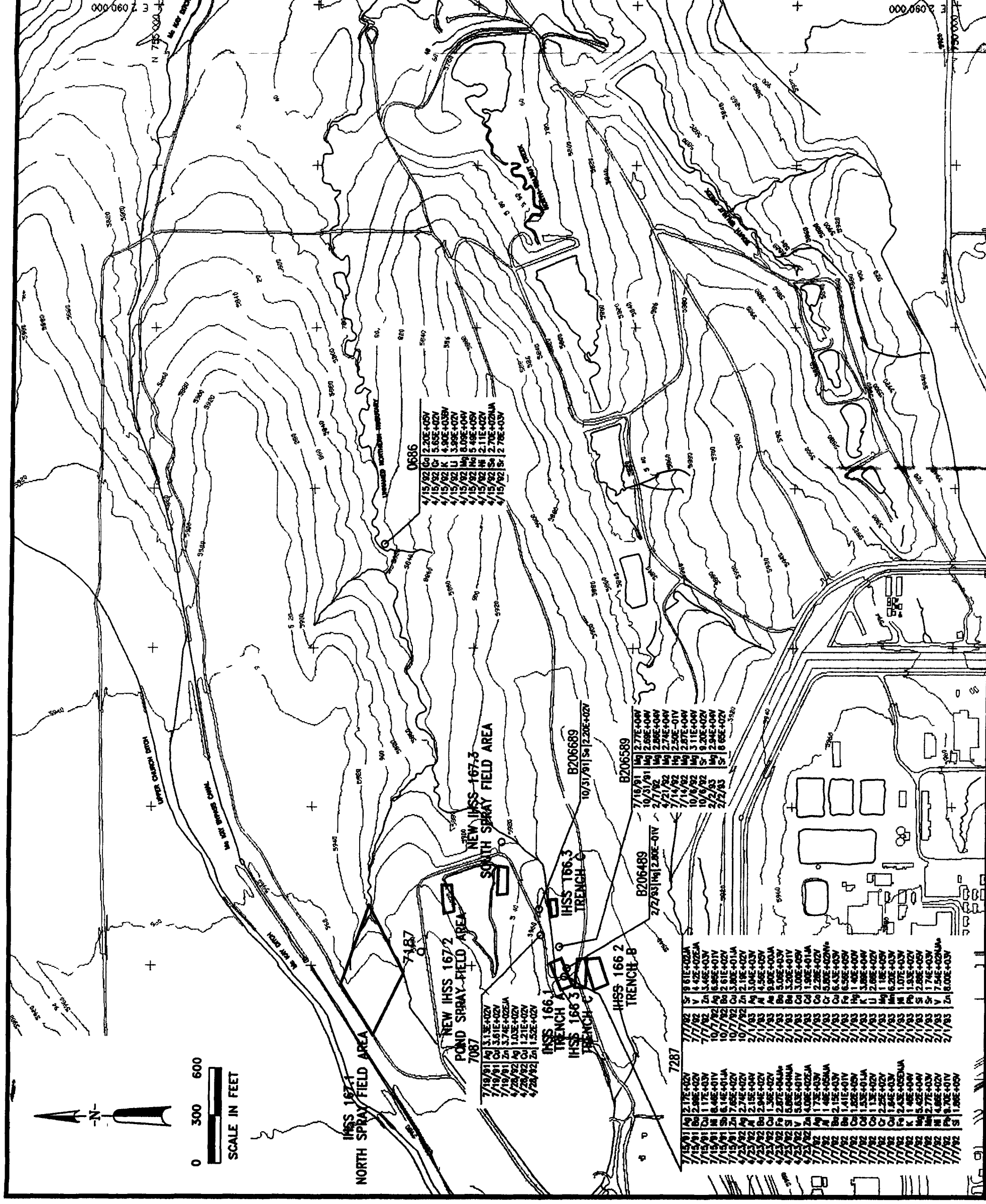
1 ALL ANALYTE CONCENTRATIONS ARE REPORTED IN ug/l (parts per billion) ANALYTE ABBREVIATIONS LAB QUALIFIERS AND VALIDATION CODES ARE PRESENTED ON FIGURE 4-2-1

2 ALL LOCATIONS SHOWN ON THIS MAP WERE SAMPLED. RESULTS ARE SHOWN ONLY WHERE THE CHEMICALS WERE DETECTED ABOVE BACKGROUND MEAN PLUS 2 STANDARD DEVIATIONS. INDICATES THIS RESULT IS AN AVERAGE OF THE REAL AND DUPLICATE SAMPLE RESULTS.

U S DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

OPERABLE UNIT NO 6
PHASE I RFI/RI REPORT

UNFILTERED METALS
AREA 1 (UNNAMED TRIBUTARY DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 -- 4th QUARTER 1993



EXPLANATION

INDIVIDUAL HAZARDOUS
SUBSTANCE SITES

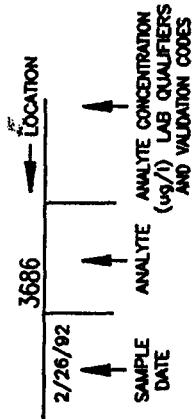


3586 ○ MONITORING WELL
(ALLUVIAL)

02691 ● MONITORING WELL
(BEDROCK)

UHSU = UPPER HYDROSTRATIGRAPHIC
UNIT

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NOTES

- 1 ALL ANALYTE CONCENTRATIONS ARE REPORTED IN ug/l (parts per billion). ANALYTE ABBREVIATIONS, LAB QUALIFIERS, AND VALIDATION CODES ARE PRESENTED ON FIGURE 4-2-1
 - 2 ALL LOCATIONS SHOWN ON THIS MAP WERE SAMPLED. RESULTS ARE SHOWN ONLY WHERE THE CHEMICALS WERE DETECTED ABOVE BACKGROUND MEAN PLUS 2 STANDARD DEVIATIONS
- * INDICATES THIS RESULT IS AN AVERAGE OF THE REAL AND DUPLICATE SAMPLE RESULTS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

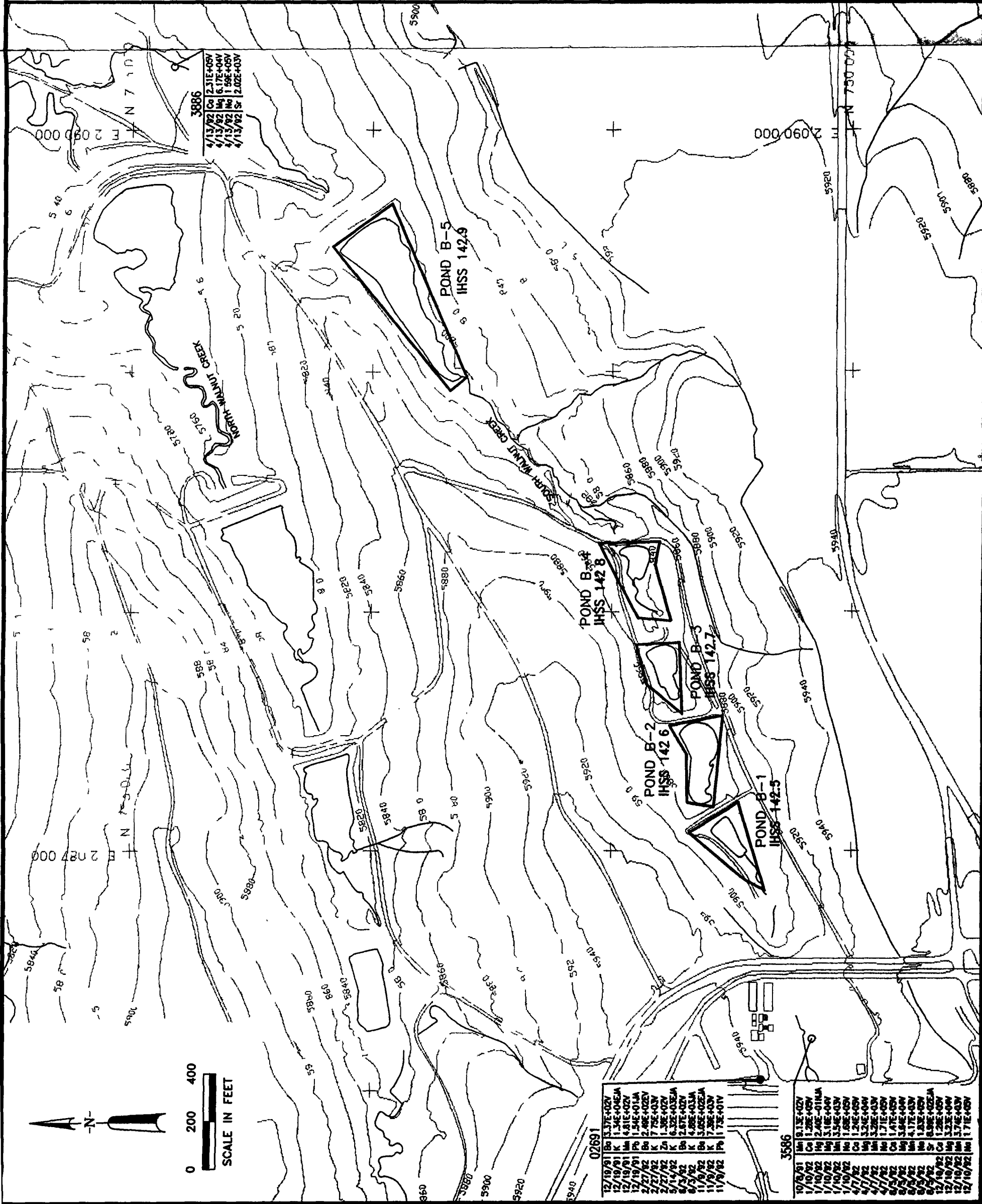
OPERABLE UNIT NO. 6
PHASE 1 RFI/RI REPORT

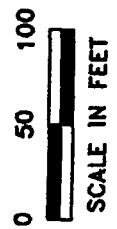
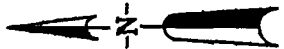
UNFILTERED METALS
AREA 3 (SOUTH WALNUT CREEK DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 - 4th QUARTER 1993

FIGURE 5-3

JANUARY 1994

0060204 1-400

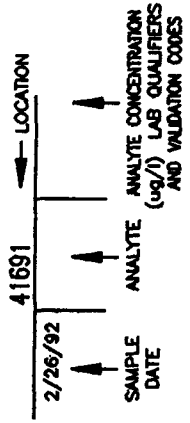




W&I POND
IHSS 142 12

41691			0486		
12/7/91	Al	1.7E+03M	9/12/91	Al	2.65E+0M
12/7/91	Ba	1.32E+03V	9/12/91	Ba	4.95E+0M
12/7/91	Ba	8.90E+00M	9/12/91	Cu	4.45E+0M
12/7/91	Cd	6.20E+00M	9/12/91	F	3.65E+0M
12/7/91	Co	8.11E+01V	9/12/91	K	8.78E+00M
12/7/91	Cr	1.84E+02V	9/12/91	Mn	2.46E+0M
12/7/91	Cu	1.89E+02M	9/12/91	Pb	2.61E+0M
12/7/91	F	1.91E+05EJA	9/12/91	Sb	5.39E+01M
12/7/91	Hg	3.80E+01V	9/12/91	V	7.31E+0M
12/7/91	K	2.25E+0M	9/12/91	Zn	5.02E+0M
12/7/91	Mn	4.18E+0M	11/14/91	Al	3.66E+0M
12/7/91	Mn	3.01E+03V	11/14/91	As	8.00E+0B
12/7/91	Ni	1.39E+02V	11/14/91	Ba	7.86E+0M
12/7/91	Pb	9.66E+01SV	11/14/91	Ba	3.90E+00B
12/7/91	Sb	1.94E+02M	11/14/91	Co	4.07E+01B
12/7/91	Sr	9.31E+02M	11/14/91	Cr	2.39E+0M
12/7/91	V	3.12E+02V	11/14/91	Cu	8.93E+0M
12/7/91	Zn	6.65E+02EJA	11/14/91	F	7.09E+0M
4/1/92	Al	3.01E+0M	11/14/91	K	1.04E+0M
4/1/92	Ba	4.27E+02V	11/14/91	Mn	3.19E+0M
4/1/92	Cu	4.65E+01V	11/14/91	Ni	1.86E+0M
4/1/92	F	4.81E+04M	11/14/91	Pb	6.12E+0M
4/1/92	K	9.30E+03V	11/14/91	Sb	1.17E+0M
4/1/92	Mn	1.59E+03V	11/14/91	V	1.09E+0M
4/1/92	Pb	3.28E+01V	11/14/91	Zn	2.63E+0M
4/1/92	V	8.92E+01V	04/1/92	K	5.25E+0M
4/1/92	Zn	1.60E+02EJA	4/1/92	Mn	1.14E+0M
6/11/92	Al	1.03E+01M	6/11/92	Al	2.10E+0M
6/11/92	As	6.42E+00M	6/11/92	Ba	3.33E+0M
6/11/92	Ba	6.05E+02V	6/11/92	Cr	2.47E+0M
6/11/92	Co	6.67E+01V	6/11/92	F	2.73E+0M
6/11/92	Co	8.05E+0M	6/11/92	K	8.33E+0M
6/11/92	Hg	7.20E+01M	6/11/92	Mn	1.53E+0M
6/11/92	K	1.44E+0M	6/11/92	Ni	8.19E+0M
6/11/92	Mn	3.03E+0M	6/11/92	Pb	2.04E+0M
6/11/92	Ni	1.18E+03V	6/11/92	Sb	4.86E+0M
6/11/92	Pb	8.84E+01V	6/11/92	Si	3.25E+0M
6/11/92	Si	5.00E+01M	6/11/92	Si	7.72E+0M
6/11/92	Si	1.25E+02V	6/11/92	Si	1.86E+0M
6/11/92	V	1.52E+02V	6/11/92	Si	1.56E+0M
6/11/92	Zn	2.50E+02V	6/11/92	Si	2.58E+0M
9/16/92	Al	2.54E+04M	11/18/92	Al	3.67E+0M
9/16/92	Ba	3.13E+02V	11/18/92	Co	1.57E+0M
9/16/92	Co	9.22E+03V	11/18/92	Co	2.04E+0M
9/16/92	K	9.22E+03V	11/18/92	Fe	8.77E+0M
9/16/92	Mn	7.54E+02V	11/18/92	K	1.81E+0M
9/16/92	Si	1.02E+01V	11/18/92	Mn	7.49E+0M
9/16/92	Si	6.37E+0M	11/18/92	Ni	1.85E+0M
9/16/92	Si	6.37E+0M	11/18/92	Pb	8.21E+0M
9/16/92	V	0.830E+01V	11/18/92	Sb	6.08E+0M
11/18/92	Ba	2.82E+02V			
11/18/92	Co	2.55E+04M			
11/18/92	Fe	7.98E+03V			
11/18/92	K	7.98E+03V			
11/18/92	Mn	8.78E+02V			
11/18/92	Ni	1.83E+01M			
11/18/92	Pb	1.83E+01M			
11/18/92	Si	8.48E+0M			
11/18/92	Si	7.48E+0M			
11/18/92	Si	4.90E+00B			
11/18/92	Si	4.73E+01B			
2/16/94	Co	4.73E+01B			
2/16/94	Cu	19.01E+01V			

For Comments and discus
Not approved for distribution



NOTES

1. ALL ANALYTE CONCENTRATIONS ARE REPORTED IN ug/l (parts per billion). ANALYTE ABBREVIATIONS LAB QUALIFIERS AND VALIDATION CODES ARE PRESENTED ON FIGURE 4-2-1.
 2. ALL LOCATIONS SHOWN ON THIS MAP WERE SAMPLED. RESULTS ARE SHOWN ONLY WHERE THE CHEMICALS WERE DETECTED ABOVE BACKGROUND MEAN PLUS 2 STANDARD DEVIATIONS.
- * INDICATES THIS RESULT IS AN AVERAGE OF THE REAL AND DUPLICATE SAMPLE RESULTS

U S DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

OPERABLE UNIT NO 6
PHASE I RFI/RI REPORT

UNFILTERED METALS
AREA 5 (W&I DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 - 4th QUARTER 1993

FIGURE 5-4

JANUARY 1994

OUR206 1-100

EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITES

**MONITORING WELL
(ALLUVIAL)**

MONITORING WELL (COLLUVIAL)

UHSU = UPPER HYDROSTRATIGRAPHIC UNIT

41091 LOCATION

2/26/92

ANALYTE CONCENTRATION (ug/l), LAB QUALIFIERS AND VALIDATION CODES

ANALYTE

SAMPLE DATE

(V) - VOLATILE

NOTES

1 ALL ANALYTE NOTATIONS ARE REPORTED IN ug/l (parts per billion) ANALYTE ABBREVIATIONS LAB QUALIFIERS AND VALIDATION CODES ARE PRESENTED ON FIGURE 4 2-1

2 ALL LOCATIONS SHOWN ON THIS MAP WERE
SAMPLED RESULTS ARE SHOWN ONLY WHERE
THE CHEMICALS WERE DETECTED

3 PESTICIDE/PCB ANALYSES WERE PERFORMED ONLY
AT LOCATION 41091

INDICATES THIS RESULT IS AN AVERAGE OF THE
REAL AND DUPLICATE SAMPLE RESULTS

U S DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

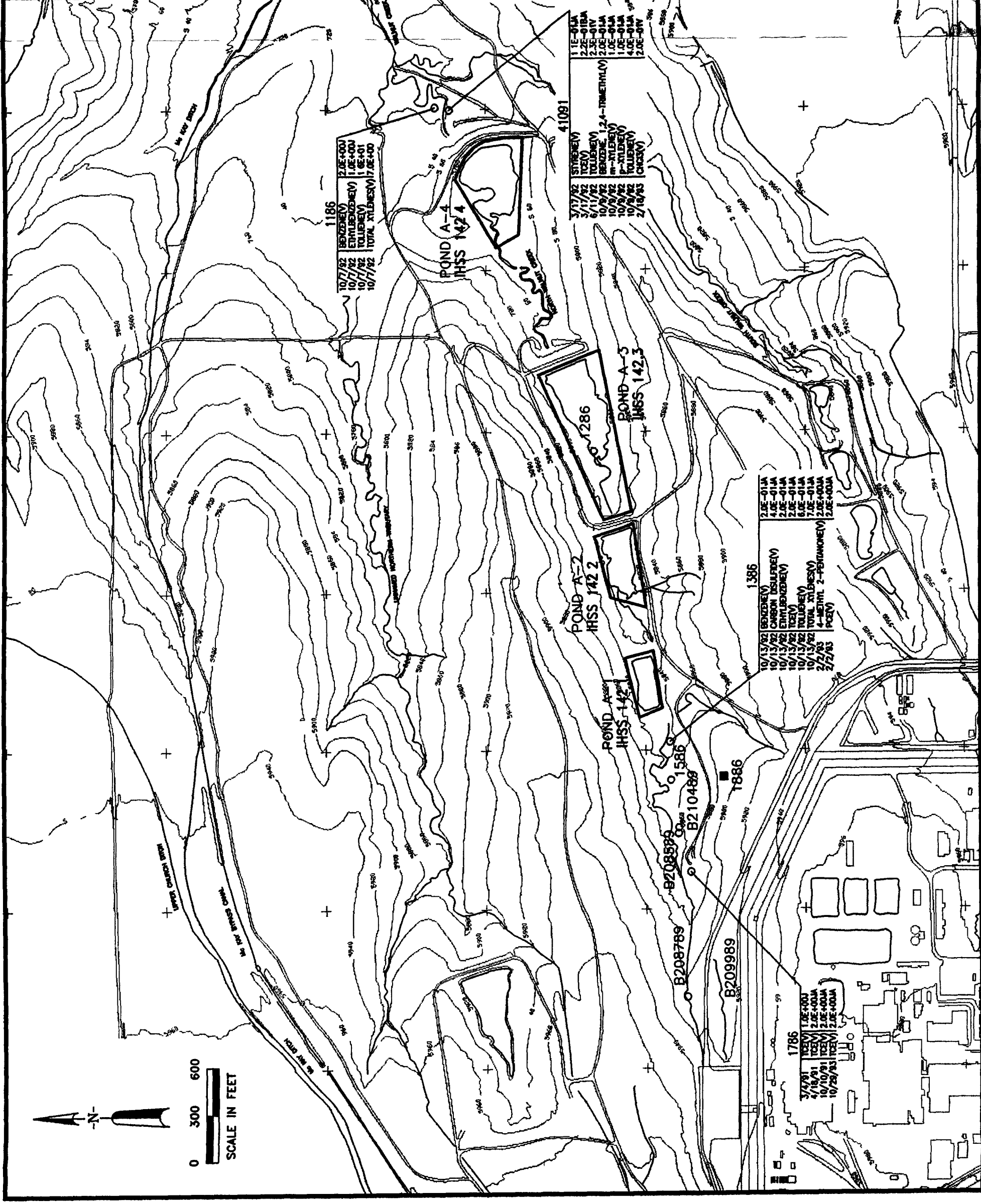
**OPERABLE UNIT NO 6
PHASE I RFI/RI REPORT**

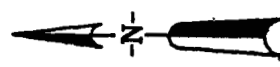
ORGANIC COMPOUNDS
AREA 2 (NORTH WALNUT CREEK DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 - 4th QUARTER 1993

FIGURE 5-6

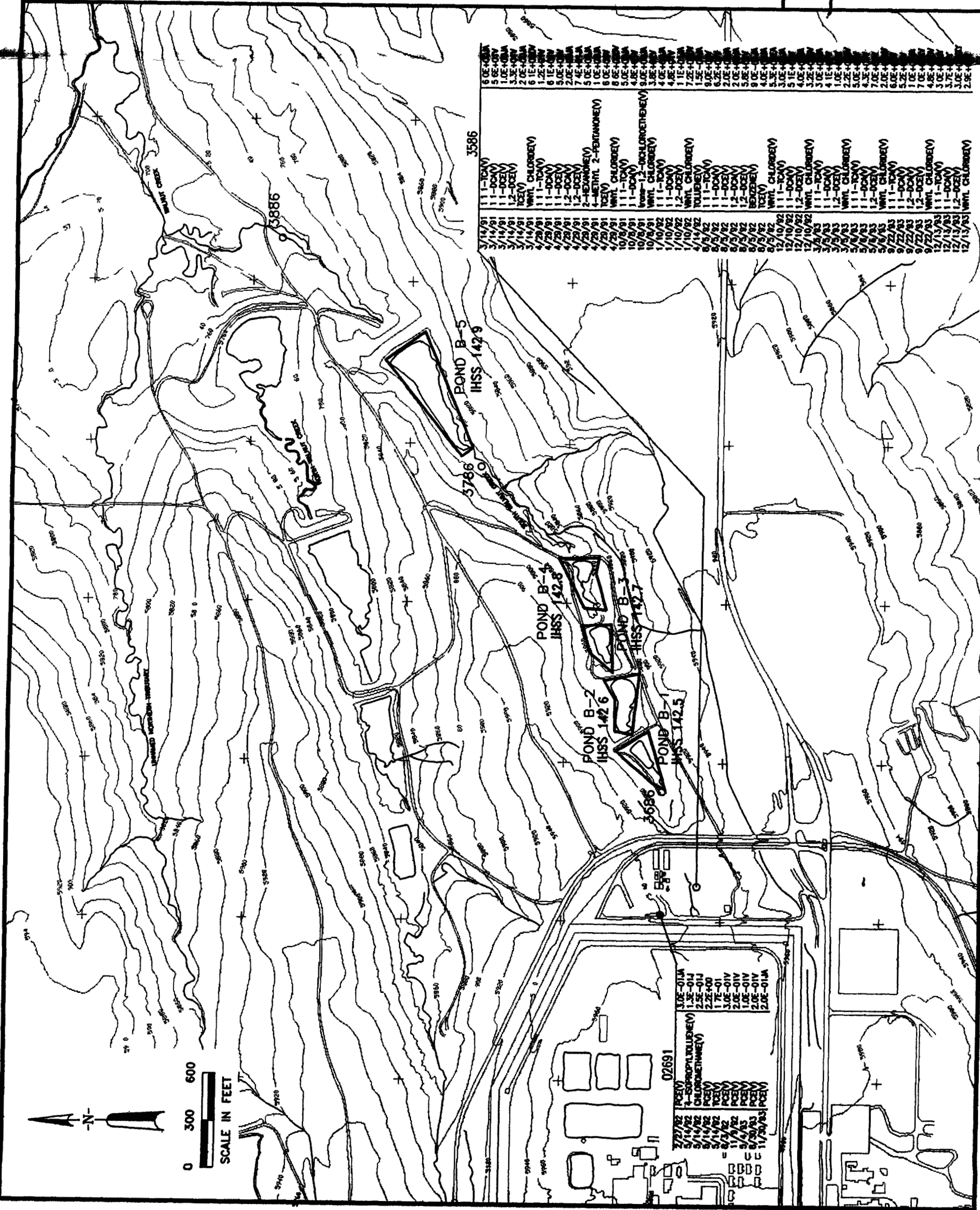
JANUARY 1994

OU671140 1-600





0 300 600
SCALE IN FEET



EXPLANATION



INDIVIDUAL HAZARDOUS
SUBSTANCE SITES

3586 ○

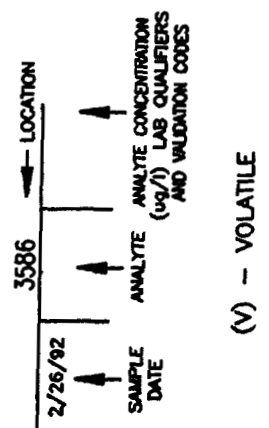
MONITORING WELL
(ALLUVIAL)

02691 ●

MONITORING WELL
(BEDROCK)

UHSU = UPPER HYDROSTRATIGRAPHIC
UNIT

DRAFT
For comments and discussion
Not approved for distribution



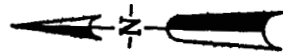
NOTES

- 1 ALL ANALYTE CONCENTRATIONS ARE REPORTED IN ug/l (parts per billion). ANALYTE ABBREVIATIONS LAB QUALIFIERS AND VALIDATION CODES ARE PRESENTED ON FIGURE 4-2-1
 - 2 ALL LOCATIONS SHOWN ON THIS MAP WERE SAMPLED. RESULTS ARE SHOWN ONLY WHERE THE CHEMICALS WERE DETECTED
 - 3 PESTICIDE/PCB ANALYSES WERE PERFORMED AT ONLY LOCATION 02691
- INDICATES THIS RESULT IS AN AVERAGE OF THE REAL AND DUPLICATE SAMPLE RESULTS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

OPERABLE UNIT NO. 6
PHASE 1 RFT/RI REPORT

ORGANIC COMPOUNDS
AREA 3 (SOUTH WALNUT CREEK DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 - 4th QUARTER 1993



0 50 100
SCALE IN FEET

5660

W&I POND
IHSS 142 12

00486
41691
02/28/92 10:00 AM 0113E-013

EXPLANATION



INDIVIDUAL HAZARDOUS
SUBSTANCE SITES

0486 ○

MONITORING WELL
(ALLUVIAL)

UHSU = UPPER HYDROSTRATIGRAPHIC
UNIT

DRAFT
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0486		LOCATION
2/28/92	↑	↑
SAMPLE DATE	ANALYTE	ANALYTE CONCENTRATION (ug/l) LAB QUALIFIERS, AND VALIDATION CODES

(V) - VOLATILE

NOTES

- 1 ALL ANALYTE CONCENTRATIONS ARE REPORTED IN ug/l (parts per billion) ANALYTE ABBREVIATIONS LAB QUALIFIERS AND VALIDATION CODES ARE PRESENTED ON FIGURE 4-2-1
 - 2 ALL LOCATIONS SHOWN ON THIS MAP WERE SAMPLED RESULTS ARE SHOWN ONLY WHERE THE CHEMICALS WERE DETECTED
 - 3 PESTICIDE/PCB ANALYSES WERE PERFORMED ONLY AT LOCATION 41691
- * INDICATES THIS RESULT IS AN AVERAGE OF THE REAL AND DUPLICATE SAMPLE RESULTS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant Golden Colorado

OPERABLE UNIT NO. 6
PHASE I RFI/RI REPORT

ORGANIC COMPOUNDS
AREA 5 (W&I DRAINAGE)
UHSU GROUNDWATER
1st QUARTER 1991 - 4th QUARTER 1993